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Post-fire Vegetation and fuel Succession in the White Cap Wilderness Study Area: 1972 - 1980

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Post-Fire Vegetation and Fuel Succession in the White Cap Wilderness Study Area: 1972 - 1980

submitted by

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submitted to

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Intermountain Research Station

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FINAL REPORT FOR COOPERATIVE AGREEMENT NO. 22-C-3-INT-28-CA, Fire management planning and evaluation in the northern Rockies, with SYSTEMS FOR ENVIRONMENTAL MANAGEMENT.
Co-op contact: Collin D. Bevins
FS contact: James K. Brown

Three papers:
Effects of prescribed fire on forest fuel distributions eight and eleven years after burning.

Howard Creek fuels management plan.

Post-fire vegetation and fuel succession in the White Cap wilderness study area: 1972 - 1980.

PREFACE

This report is submitted in fulfillment of Section I, paragraph B of cooperative aid agreement 22-C-3-INT-28-CA, entitled "Fire Management Planning and Evaluation in the Northern Rockies." The specific objective of this portion of the agreement was to:

"Analyze, summarize, and present fuel and vegetation data to evaluate performance of White Cap Creek Fire Management Plan, Selway-Bitterroot Wilderness."

Adoption of the Plan in 1972 established a prototype area of Wilderness Fire Management. Suppression was no longer the rule -- fires were scrutinized and managed within decision trees. Recently expanded, a fire management plan now covers most of the Selway-Bitterroot Wilderness Area. Every summer management fires are allowed to burn in the wilderness. Most burn for several days, but some sputter and run over the course of many weeks, occassionally filling local valleys with a smokey haze that provides spectacular sunsets.

The White Cap study area has provided a perfect laboratory for extended observation of ecological responses to a more natural fire environment. Extensive field inventories began in 1970 to establish baseline data on landforms and soils, fish, wildlife and plant communities, fire history and fire potential in the area. Through continued efforts by the Northern Forest Fire and the Fire Sciences Laboratories in Missoula, several permanent fuel and vegetation plots were inventoried almost yearly between 1973 and 1980 in areas burned by the 1973 Fritz Creek Fire (which burned 1200 acres over six weeks).

After 1980, data collection ceased and the data, although processed through some data reduction programs, were never compiled into a concise report. This report describes the consequences of delving into a box labelled "White Cap Stuff." It presents the fuel and vegetation succession data collected through the years in the White Cap Drainage. Finally...

INTRODUCTION and BACKGROUND

In 1970, Region One of the USDA, Forest Service initiated the White Cap Wilderness Fire Management Study in the 1.2 million acre Selway-Bitterroot Wilderness Area. The study was to investigate fires' role in wilderness and to describe inventories and procedures needed in fire management planning. Specific areas to be inventoried were hydrology, landforms and soil, fish and plant communities, fuels, fire potential and fire history. White Cap drainage was chosen as the study area because of its breadth of wilderness values, diversity of landscape, plant communities and old burn fire mosaics, and its accessibility from the Paradise campground and guard station. The 100 square-mile study area is located on the Magruder Ranger District of the Bitterroot National Forest in Northern Idaho and Western Montana. Its namesake, White Cap Creek flows into the beautiful Selway River, which feeds the Lochsa-- the wild whitewater tributary of Northern Idahos' Clearwater River.

Field work for the project began in 1971. Systems of permanent fuel and vegetation plots were established throughout the drainage to monitor ecological successsion in fire-free and fire-impacted areas. Landforms, soils, and hydrologic parameters were assessed and fish communities were inventoried.

Four basic landform processes characterize the area: stream action (breaklands and stream deposition), frost churning (cryoplanation), surface runoff (fluvial), and glaciation (morains and valley through wall).

The soils of the area, developed from major rock types of granite, gneiss, and rhyolite, generally exhibited course textures and low water holding capacity. Loamy Sand and Sandy Loam are the most common soil types.

The air and water quality in the area are excellent and White Cap Creek supports good supplies of native rainbow and cutthroat trout. The clear rocky bottoms of all streams in the upper Selway River Drainage also provide marginal spawning grounds for two anadromous fish--the chinook salmon and steelhead trout.

A fire history study (Appendix A) of the White Cap drainage documented 212 fires from 1926 through 1970. All but six (97 percent) were lightning caused and three-forths of all the fires burned less than one quarter acre each. Together, the remaining fifty-eight fires burned 1247 acres (about the size of the Fritz Creek Fire) in the study area over 45 years of fire suppression. The area averaged 4.7 fires per year. Five years had no fires and one (1961) had 19 fires. The majority of fires started on exposures with a south component at elevations between six and eight thousand feet. Ponderosa Pine/Douglas Fir cover types averaged fires once every nine years, Shrubfields were estimated to average 13 years between fires, and Ponderosa Pine Savanna areas averaged about 20 years.

Fire potential was measured in terms of spread and intensity, stratified by habitat and timber types. Shrubfields had the highest spread, but lowest intensity potential. Douglas-fir timber types had high intensity but relativley low spread potential, while Ponderosa Pine timber types had the overall highest fire potential.

Fire management zones were developed and identified by five basic vegetation types or ecological land units: Shrubfield; Ponderosa Pine Savanna; Ponderosa Pine/Doulas-fir; North Slope Communnities, and Subalpine zones. Management strategies were formulated and in August of 1972 the White Cap Wilderness Fire Management Plan was approved. Fire management officially replaced fire suppression in a portion of the Selway-Bitterroot Wilderness. The plan called for monitoring all fires occurring in fire management zones while weather conditions remained below threshold levels. Monitored fires that threatened zone boundaries were to be controlled at the threatened boundary, and if burning conditions exceeded thresholds, suppression action would be initiated.

Just weeks after the plan was approved, lightning started the Bad Luck Creek fire. The first management fire was burning! It was monitored as it raged through twenty-four square feet of shrubfield before going out by itself after four days. There were no more ignitions in the study area in 1972.

The first year with the plan in place for the full fire season was 1973 -- a

very dry year. On August 10th, a lightning storm ignited a series of management fires in the study area which were monitored and/or suppressed in accordance with the plan (see Appendix B). One, the Fritz Creek Fire, burned through three permanent fuel plot stands. The fire burned over 1200 acres during its six week life. Within days, five permanent vegetation plots were established in the burned area to monitor plant succession. In 1974, a fourth fuel, and sixth vegetation inventory stand were established together in a new stand. Data from the four fuel and six vegetation stands are discussed in this report.

FUELS SAMPLING METHODS AND DATA REDUCTION

Beginning in 1971 over 1,500 permanent fuel plots were established in over 100 stands in the study area. Using a planer intersect method of inventoring surface fuels just developed by Dr. Jim Brown of the then Northern Forest Fire Laboratory (Brown 1974; Brown and others, 1984), dead fuel intersections were tallied by particle diameter and condition:

- Less than 0.25 inches,
- 0.25 to 1 inch,
- 1 to 3 inches,
- 3 to 6 inches, differentiated by sound or rotten class,
- 6 to 10 inches, differentiated by sound or rotten class,
- 10 to 20 inches, differentiated by sound or rotten class,
- greater than 20 inches, differentiated by sound or rotten class,
- dead herbaceous material,
- dead shrubs, and
- cones on the ground (sporadically).

Live fuel component intersections were tallied by:

- shrub diameter (cm) class (0-.5, .5-1, 1-1.5, 1.5-2, 2-3, 3-5, 5+) and species,
- herbaceous material (no species identification),
- tree needles, and
- small tree seedlings by species and height.

Fuel bed depth measurements were taken for brush, duff, and live and dead fuel horizons.

Stand attributes noted were:

- habitat type (from Pfister and others, 1972, 1977),
- timber cover type,
- stand age, slope, aspect, and elevation,
- percent of stand covered by shrubs (spilt by live or dead),
- percent of stand covered by herbs (split by live or dead).

The fuel stands burned in the Fritz Creek Fire (36, 37, and 70) were reinventoried right after the fire in 1973, yearly through 1977, and again in 1980. From data summary sheets it appears that about 10 plots were added in each stand after the fire, although it is not documented anywhere. A fourth stand (1370) was located in the burned area with a vegetation plot (WC-06) in 1974. A list of fuel stands whose data are available for this report, their attributes, and years of inventory is presented in table 1.

Table 1: Stand Attributes of White Cap Fuel Succession Plots

Stand Number	36	37	70	1370
Number of Plots	20	20	15	15
Avg. Elevation (ft)	3800	4200	4950	3800
Avg. Slope (%)	68	55	47	78
Avg. Aspect	290	130	310	250
Stand Age	108	113	40	Missing
Habitat Type	DF/phme-phme	DF/phme-phme	GF/Cooh	DF/phme-phme
Cover Type	PP, DF	PP	DF	Missing
Slope Position	upper	upper	upper	upper
Years Sampled	72-77,80	72-77,80	72-77,80	74-77,80

Raw plot data (15 to 20 plots per stand) were processed through the FUELS computer program in the STAND BIOMASS system (Brown and others, 1982) by Rick Oberheau (NFFL). The FUELS program estimates fuel biomass for each stand and generates stand summaries:

- -- mean fuel loads (pounds/acre), standard deviations, and standard errors,
- -- a summary of duff and shrub fuel complex depths,
- -- a summary of shrub loads by species and particle diameter,
- -- a summary of percentage (cover and dead) estimates of shrubs and herbs,
- -- a volume summary of greater than 3 inch diameter sound and rotten fuel,
- -- a summary of small tree seedling count by species, and
- -- a summary of stand topographic conditions and its habitat type.

Appendix C contains an example of output from the FUELS program. Reports from the FUELS program provide the basis for fuels succession data here

FUELS DATA SUMMARY

FUELS summaries has been consoldated into eleven classes for presentation:

-- less than 0.25 inches,
-- .25 to 1 inch,
-- 1 to 3 inches,
-- greater than 3 inches (sound),
-- greater than 3 inches (rotten),
-- Litter,
-- Duff,
-- Dead Herbaceous Fuel,
-- Dead Shrubs,
-- Live Herbaceous Fuels, and
-- Live Shrubs.

The authors make no assertation to the accuracy of the data and note some obvious data problems. Some could be attributed to sampling design, some to field methods and crews, and some to the inherent variability of fuels. For example, one fuel stand had 1,068 lbs/acre rotten fuels measured in 1972, none from 1973 through 1977, and 7.2 million lbs/acre in 1980. Another fuel stand measured a two percent shrub biomass increase between 1972 and 1973, while experiencing an 83 percent decrease in shrub coverage and 72 percent decrease in shrub depth. Is that real? Duff biomass values were zero at each stand in 1974. Accurate? Could be since data from 1973 and 1975 do not reject it, but still it's hard to believe. Seedling counts appear particularly sporadic for fixed plots. Are zero values good counts or no inventory? From the FUELS summary sheets it is hard to tell.

Obviously erroneous data (such as the 7.2 million lbs/acre example) have been excluded from the biomass summaries. Seedling data are presented in occurrence checklists but excluded from biomass summaries and cones are excluded entirely. When observing and comparing graphs, please note scale differences and upper boundary breaks in some of the figures.

DEAD FUELS

Tables 2, 3, 4, and 5 summarize fuel biomass data for stands 36, 37, 70, and 1370, respectively. Also in the tables is the yearly percent difference from the 1972 inventory (except stand 1370 which is from 1974). Dead fuels generally composed about 95 percent of each stands fuel biomass, and together, duff and large fuels (3 inch plus) composed about 85 percent of a stands' biomass. Most fuel components, but particularly duff, dead shrubs, and large fuels (sound and rotten) exhibited

Table 2: White Cap Wilderness: Pre and Post Fire Fuel Loads --- Stand Number 036, pounds/acre

FUEL CATEGORY	Pre Fire 1972	1973	Change	1974	Change	POST FIRE 1975	Change	1976	Change	1977	Change	1980	Change
< .25"	271	161	-41%	216	-20%	206	-24%	51	-81%	272	0%	148	-45%
.25" to 1"	578	342	-41%	421	-27%	730	26%	1287	123%	958	66%	1399	142%
1" to 3"	627	0	-100%	0	-100%	516	-18%	887	41%	514	-18%	711	13%
3"+ Sound	2442	0	-100%	0	-100%	224	-91%	574	-76%	455	-81%	2887	18%
3"+ Rotten	1068	0	-100%	0	-100%	0	-100%	0	-100%	0	-100%	0	-100%
Litter	1339	1052	-21%	1197	-11%	1115	-17%	1549	16%	3073	129%	2789	108%
Duff	3993	272	-93%	0	-100%	1271	-68%	771	-81%	2813	-30%	11571	190%
Dead Herbs	18	0	-100%	31	72%	10	-44%	8	-56%	7	-61%	22	22%
Dead Shrubs	172	1349	684%	25	-85%	6	-97%	23	-87%	20	-88%	12	-93%
TOTAL DEAD	10508	3176	-70%	1890	-82%	4078	-61%	5150	-51%	8112	-23%	19539	86%
Live Herbs	55	0	-100%	173	215%	251	356%	242	340%	200	264%	377	585%
Live Shrubs	1213	68	-94%	297	-76%	191	-84%	272	-78%	291	-76%	423	-65%
TOTAL LIVE	1268	68	-95%	470	-63%	442	-65%	514	-59%	491	-61%	800	-37%
TOTAL FUEL	11776	3244	-72%	2360	-80%	4520	-62%	5664	-52%	8603	-27%	20339	73%

Table 3: White Cap Wilderness: Pre and Post Fire Fuel Loads --- Stand Number 037, pounds/acre

FUEL CATEGORY	Pre Fire 1972	1973	Change	1974	Change	POST FIRE 1975	Change	1976	Change	1977	Change	1980	Change
< .25"	350	138	-61%	573	64%	456	30%	47	-87%	245	-30%	198	-43%
.25" to 1"	882	662	-25%	576	-35%	610	-31%	977	11%	691	-22%	373	-58%
1" to 3"	0	0	0%	493	49300%	1015	101500%	1853	185300%	339	33900%	2064	206400%
3"+ Sound	0	662	66200%	1106	110600%	670	67000%	429	42900%	556	55600%	2612	261200%
3"+ Rotten	717	0	-100%	2324	224%	1004	40%	1523	112%	1220	70%	0	-100%
Litter	630	658	4%	1129	79%	660	5%	1231	95%	1588	152%	1606	155%
Duff	6292	2904	-54%	0	-100%	272	-96%	1225	-81%	3539	-44%	9620	53%
Dead Herbs	22	1	-95%	35	59%	6	-73%	8	-64%	17	-23%	19	-14%
Dead Shrubs	922	283	-69%	44	-95%	15	-98%	23	-98%	204	-78%	9	-99%
TOTAL DEAD	9815	5308	-46%	6280	-36%	4708	-52%	7316	-25%	8399	-14%	16501	68%
Live Herbs	74	9	-88%	237	220%	242	227%	242	227%	329	158%	278	276%
Live Shrubs	1268	15	-99%	309	-76%	266	-79%	272	-79%	217	-49%	291	-77%
TOTAL LIVE	1342	24	-98%	546	-59%	508	-62%	514	-62%	546	-38%	569	-58%
TOTAL FUEL	11157	5332	-52%	6826	-39%	5216	-53%	7830	-30%	7881	-17%	17070	53%

Table 4: **White Cap Wilderness: Pre and Post Fire Fuel Loads --- Stand Number 070, pounds/acre**

FUEL CATEGORY	Pre Fire 1972	POST FIRE 1973	Change	1974	Change	1975	Change	1976	Change	1977	Change	1980	Change
< .25"	393	51	-87%	218	-45%	177	-55%	99	-75%	294	-25%	735	87%
.25" to 1"	725	117	-84%	415	-43%	553	-24%	631	-13%	1440	99%	3862	433%
1" to 3"	865	0	-100%	403	-53%	1871	116%	1250	45%	2315	168%	7256	739%
3"+ Sound	1728	12578	628%	0	-100%	12868	645%	17508	913%	23719	1273%	24192	1300%
3"+ Rotten	45275	17420	-62%	26892	-41%	338	-99%	2985	-93%	3443	-92%	10804	-76%
Litter	612	1594	160%	2015	229%	1974	223%	1332	118%	918	50%	462	-25%
Duff	72163	0	-100%	0	-100%	3888	-95%	7775	-89%	12527	-83%	21490	-70%
Dead Herbs	22	0	-100%	4	-82%	10	-55%	45	105%	13	-41%	29	32%
Dead Shrubs	238	1	-100%	6	-97%	5	-98%	33	-86%	31	-87%	59	-75%
TOTAL DEAD	122021	31761	-74%	29953	-75%	21684	-82%	31658	-74%	44700	-63%	68889	-44%
Live Herbs	210	1	-100%	157	-25%	387	84%	778	270%	433	106%	864	311%
Live Shrubs	1865	16	-99%	229	-88%	199	-89%	514	-72%	1222	-34%	1935	4%
TOTAL LIVE	2075	17	-99%	386	-81%	586	-72%	1292	-38%	1655	-20%	2799	35%
TOTAL FUEL	124096	31778	-74%	30339	-76%	22270	-82%	32950	-73%	46355	-63%	71688	-42%

Table 5: **White Cap Wilderness Post Fire Fuel Loads --- Stand Number 1370, pounds/acre (1974 - 1980)**

FUEL CATEGORY	POST FIRE 1974	1975	% Change	1976	% Change	1977	% Change	1980	% Change
< .25"	141	161	14%	258	83%	288	104%	571	305%
.25" to 1"	113	364	222%	1054	833%	1367	1110%	5008	4332%
1" to 3"	0	1091	109100%	2267	226700%	858	85800%	3214	321400%
3"+ Sound	2603	9759	275%	11148	328%	16272	525%	31730	1119%
3"+ Rotten	17455	8063	-54%	8329	-52%	6405	-63%	7992	-54%
Litter	1978	310	-84%	489	-75%	543	-73%	464	-77%
Duff	0	1	100%	144	14400%	5472	547200%	6002	600200%
Dead Herbs	15	8	-47%	24	60%	82	447%	27	80%
Dead Shrubs	23	33	43%	0	-100%	70	204%	41	78%
TOTAL DEAD	22328	19790	-11%	23713	6%	31357	40%	55049	147%
Live Herbs	218	210	-4%	272	25%	172	-21%	456	109%
Live Shrubs	740	1275	72%	1502	103%	870	18%	1022	38%
TOTAL LIVE	958	1485	55%	1774	85%	1042	9%	1478	54%
TOTAL FUEL	23286	21275	-9%	25487	9%	32399	39%	56527	143%

radical fluctuations in biomass through the course of sampling. Standard deviations from 40 to 80 percent of the mean were common with values exceeding 150 percent of the mean more common than values under 20 percent. Across stands, litter biomass was more consistent from year to year (standard deviations about 40 percent of the mean) than were other fuels. For total fuel biomass, three stands had similar ratios of standard deviation to mean--just over 40 percent at stands 37, 70, and 1370, and 82 percent in stand 36.

In aggregate, stands 36 and 37, and stands 70 and 1370 were most similar to each other as illustrated in figure 1 which shows total fuel loads at each stand. Each stand followed a pattern of reduced fuel load for at least one year after the fire, then steadily increased in load. Stand 70 had a total fuel load in 1972 an order of magnitude higher than any other stand/year due to massive duff and 3 inch plus rotten fuel loads (72,163 and 45,275 lbs/acre respectively). This large initial load made it the only stand to have less fuel bimoass in 1980 than 1972 (or 1974 for stand 1370).

Figure 2 illustrates differences of fuel composition and succession between the two most dissimilar stands-- 36 and 70, for five fuel classes in 1972 and again in 1980. All fuels increased except for 3 inch plus (sound and rotten), shrubs, and duff at stand 70. Figure 3 illstrates the succession of small fuels (less than 1 inch), and figure 4 does the same for one to three inch fuels). Except for stand 70, smaller fuels declined the first year then began trends of increasing biomass.

Summaries of fuels greater than three inches are displayed in figures 5 and 6 for sound and rotten classes respectively. Sound loads increased markedly in stands 70 and 1370 while rotten loads had overall decreases. Stands 36 and 37 had low initial large fuel loads and did not change significantly over the course of the study.

Figure 7 shows yearly litter biomass estimates. Litter made up only small portion of a stands fuel biomass with maximum values around 3,000 lbs/acre, with most values between 500 to 1,500. Finally, figure 8 shows the wild fluctuations in

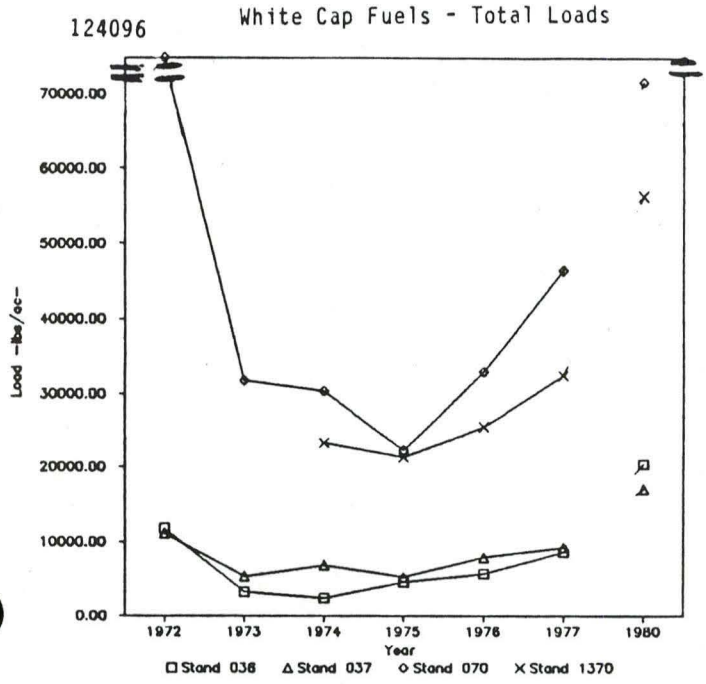

Figure 1 : White Cap Fuels - Total Loads

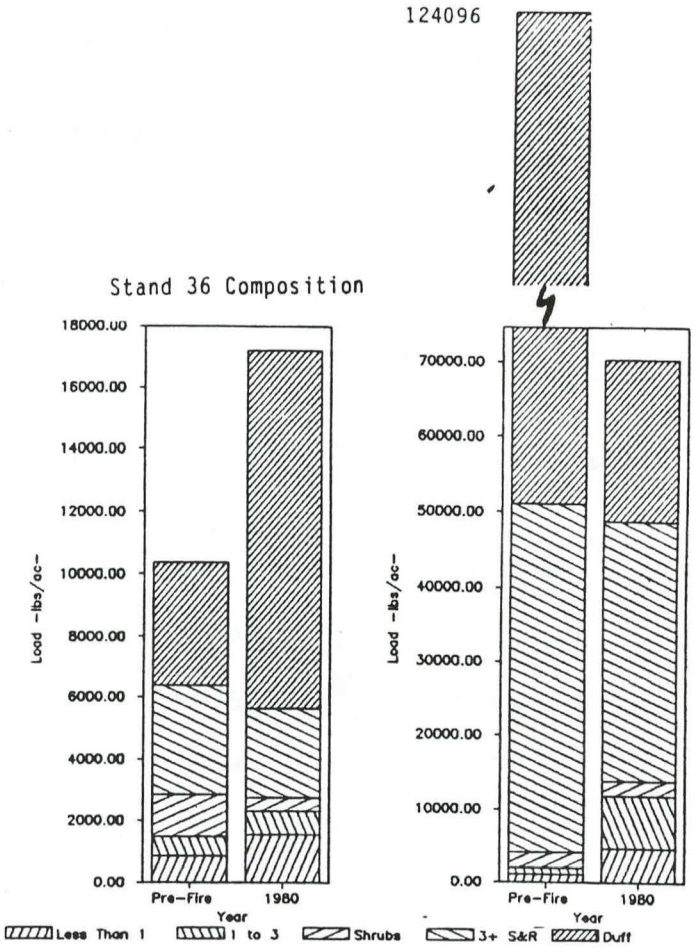

Figure 2 : White Cap Fuels - Stand 36 Composition
- Stand 70 Composition

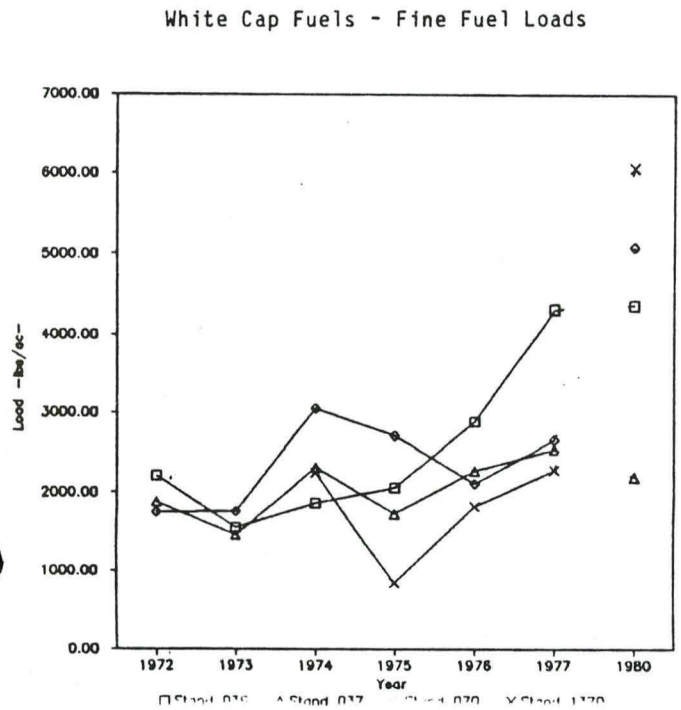

Figure 3 : White Cap Fuels - Fine Fuel Loads

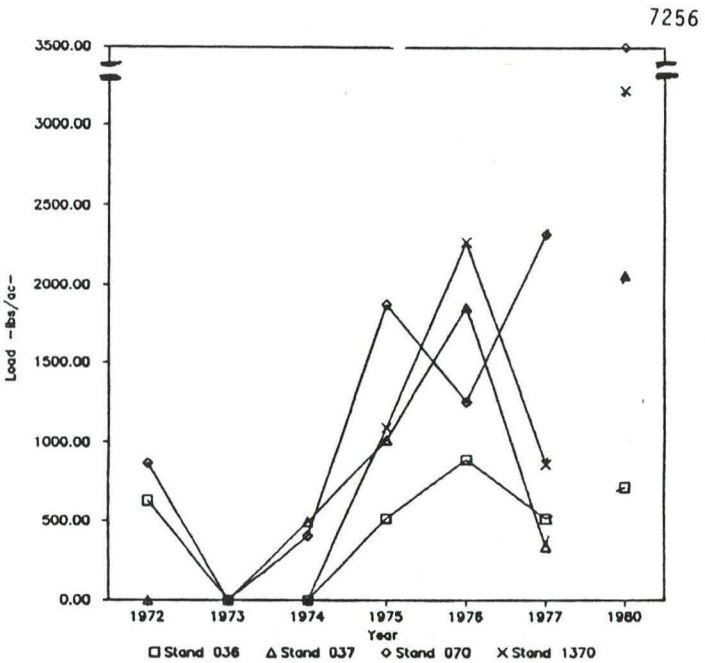

Figure 4 : White Cap Fuels - 1 to 3 Inch Loads

White Cap Fuels - 3+ Inch (Sound) Loads

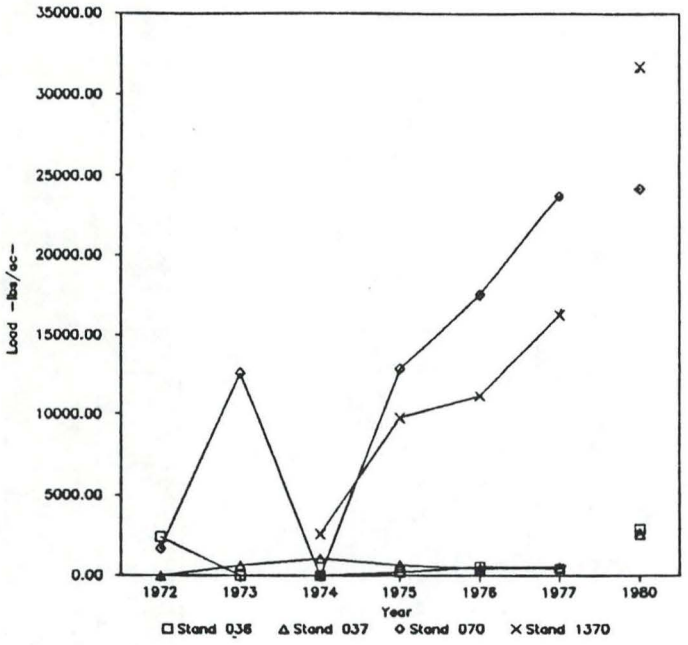

Figure 5 : White Cap Fuels - 3+ Inch (Sound) Loads

White Cap Fuels - 3+ Inch (Rotten) Loads

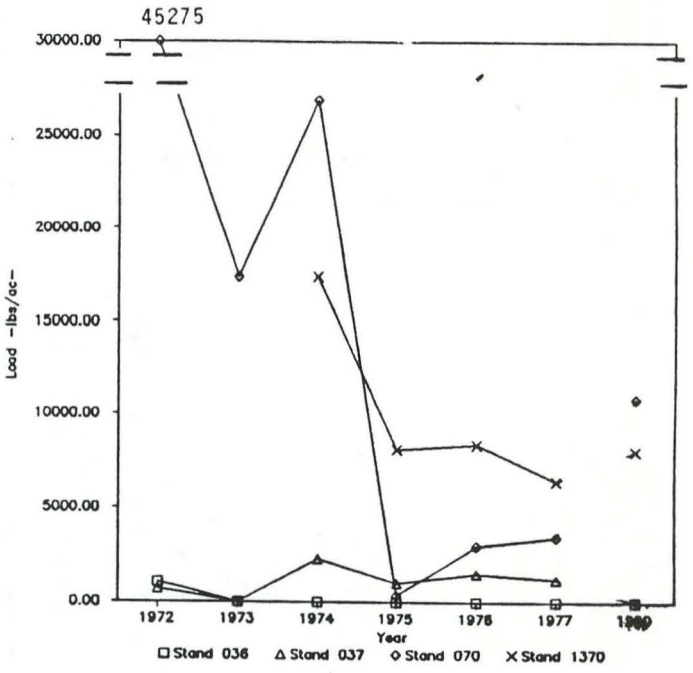

Figure 6 : White Cap Fuels - 3+ Inch (Rotten) Loads

White Cap Fuels - Litter Loads

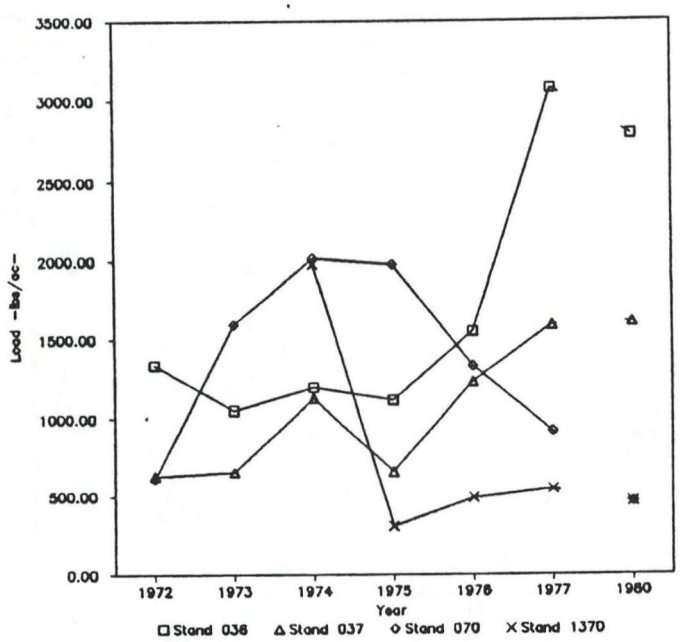

Figure 7 : White Cap Fuels - Litter Loads

White Cap Fuels - Duff Loads

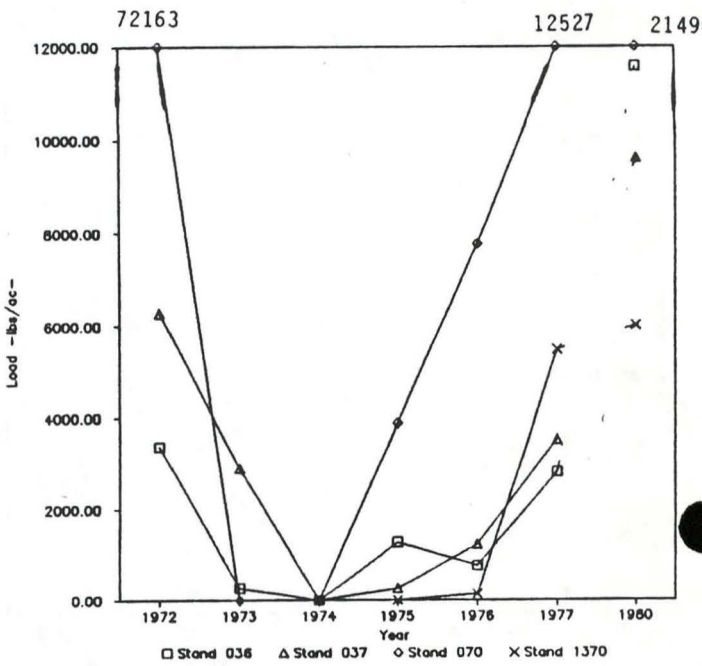

Figure 8 : White Cap Fuels - Duff Loads

duff biomass estimates. Stand 70 is in a world of its own. It dropped from over 30 tons/acre in 1972 to none in 1973 and 74, then increased to over 10 tons/acre by 1980--pretty active for a 40 year old stand. Stands 36 and 37 saw duff load increase by 190 and 53 percent respectively, from 1972 to 1980 after zero values in 1974. The zero values for duff biomass in 1974 are interesting. Surrounding values at other stands support the trend, but why all zeros in 1974? If the fire burned the duff away, I would think 1973 would have the lower values, unless a winter snowpack and spring runoff are necessary to completely remove a duff horizon.

In summary, the larger fuels (3+ inches sound and rotten) and duff dominated the biomass components of these stands, and also exhibited the largest variation (absolute and relative) between years. Almost all inventoried fuels had greater loads in 1980 than in 1972 and each stand had minimum total loads in 1974 or 1975. The largest one-year difference in total load was the decrease between pre-fire 1972 and post-fire 1973 inventories at each stand--72, 52, and 74 percent at stands 36, 37, and 70, respectively. Fuel reduction by the fire appeared variable and transient for most fuels with the exception of dead shrub and large rotten classes which remained below 1972 values. Stand 70 is an anomolie from the others--huge variations in duff and rotten loads for a 40 year old stand with permanent plots.

LIVE FUELS

Live fuels generally composed under 5 percent of the total biomass at the stands in this study. Live fuels are summmarized by biomass and yearly percent change from 1972 values in tables 2, 3, 4, and 5 with the dead fuels. Tables 6, 7, 8, and 9 present a brush species occurrence checklist and live fuels summary (shrub coverage, depth, and load; herbaceous coverage and seedling counts) for stands 36, 37, 70, and 1370 respectively. Shrub depth and biomass, and percent cover of all live fuels dropped in 1973 from 1972 values, then increased through 1980 with occassional year to year deviations. Between 1972 and 1980, stand 36 recorded a 65 percent decrease in shrub biomass, stand 37 decreased 77 percent, and stand 70 increased four percent. Ninebark, White Spirea, Rose, Ocean Spray, Serviceberry, and Snowberry were the predominate shrub species through the stands. 1973 had the fewest shrub species at each stand, but the diversity generally increased to levels matching the 1972 inventory by 1975 or 1976. Herbaceous biomass was almost totally removed at each stand by the fire, with decreases ranging from 88 to 100 percent between 1972 and 1973. From 1973 to 1980, herbaceous biomass increased 585 percent at stand 36, 276 percent at stand 37, and 311 percent at stand 70. Together live and dead herbaceous material accounted for only about one percent of the total stand biomass.

Seedlings first appeared in 1975, except at stand 37 where they appeared 1974 and increased yearly through 1977. At the other stands, the counts all went down in 1976, up in 1977, and down in 1980. Is this real? Regeneration was predominately Ponderodsa Pine at stand 36 and Douglas-Fir at the others. Stand 70 had a smattering of Grand Fir and Lodgepole in 1977 only.

Table 6:
Brush Species Occurrence Checklist and Summary of Live Fuels: Fuel Stand 036

	Year and Number of Plots Sampled in Stand						
Brush Species	1972 (30)	1973 (40)	1974 (40)	1975 (40)	1976 (40)	1977 (40)	1980 (40)
Serviceberry	*	*					*
Ninebark	*	*	*	*	*	*	*
Ocean Spray	*	*	*	*		*	*
Snowberry	*		*	*	*	*	*
Rose Spp.	*		*	*	*	*	*
White Spirea	*		*	*	*	*	*
Oregon Grape	*						
Other Spp.			*		*		*
Shrub Coverage (%)	12	2	11	12	13	10	16
Avg Shrub Depth (in)	18	5	6	6	7	5	8
Total Load (lb/ac)	1385	1417	321	197	295	311	435
Herb Coverage (%)	7	0	16	14	16	10	20
Small Trees/acre	0	0	0	225	15	1320	0

* = Species Was Present

Table 7:
Brush Species Occurrence Checklist and Summary of Live Fuels: Fuel Stand 037

	Year and Number of Plots Sampled in Stand						
Brush Species	1972 (30)	1973 (40)	1974 (40)	1975 (40)	1976 (40)	1977 (40)	1980 (10)
Serviceberry	*		*		*	*	
Ninebark	*	*	*	*	*	*	
Ocean Spray		*	*	*	*	*	*
Snowberry	*		*	*	*	*	*
Rose Spp.	*		*	*	*	*	*
White Spirea	*		*	*	*	*	*
Thimbleberry	*		*				
Chokecherry			*			*	
Mtn. Willow						*	
Other Spp.	*			*	*	*	*
Shrub Coverage (%)	19	2	11	16	16	12	22
Avg Shrub Depth (in)	26	6	7	8	7	8	10
Total Load (lb/ac)	2190	297	353	282	253	850	300
Herb Coverage (%)	9	2	18	18	24	6	25
Small Trees/acre	0	0	75	195	600	2670	M

* = Species Was Present

Table 8:
Brush Species Occurrence Checklist and Summary of Live Fuels: Fuel Stand 070

	Year and Number of Plots Sampled in Stand						
Brush Species	1972 (20)	1973 (30)	1974 (30)	1975 (30)	1976 (30)	1977 (30)	1980 (30)
Ninebark	*	*	*		*	*	
Ocean Spray		*			*	*	*
Mtn. Maple			*		*	*	*
Mtn. Willow	*		*	*	*	*	*
Snowberry	*		*	*	*	*	*
Rose Spp.	*		*	*	*	*	*
White Spirea	*		*	*	*	*	*
Thimbleberry	*		*			*	*
Serviceberry	*			*	*		*
Honeysuckle	*						*
Huckleberry	*						*
Gooseberry							*
Menziesia	*						
Other Spp.			*	*			*
Shrub Coverage (%)	29	.5	11	14	29	21	36
Avg Shrub Depth (in)	22	.6	10	13	20	24	27
Total Load (lb/ac)	2103	17	236	204	548	1253	1994
Herb Coverage (%)	13	0	20	26	30	24	40
Small Trees/acre	0	0	0	220	120	1100	600

* = Species Was Present

Table 9:
Brush Species Occurrence Checklist and Summary of Live Fuels: Fuel Stand 1370

	Year and Number of Plots Sampled in Stand						
Brush Species	1972 (00)	1973 (00)	1974 (30)	1975 (30)	1976 (30)	1977 (30)	1980 (30)
Serviceberry			*	*	*	*	*
Mtn. Maple			*		*		
Mtn. Willow				*	*	*	*
Ninebark			*	*	*	*	*
Ocean Spray					*	*	*
Snowberry			*	*	*	*	*
Rose Spp.			*	*	*	*	*
White Spirea			*	*	*	*	*
Thimbleberry			*	*	*		*
Oregon Grape			*	*	*	*	
Mock Orange				*			
Other Spp.				*	*	*	*
Shrub Coverage (%)	M	M	23	50	M	23	41
Avg Shrub Depth (in)	M	M	15	21	20	23	18
Total Load (lb/ac)	M	M	763	1308	1502	940	1063
Herb Coverage (%)	M	M	14	12	M	23	18
Small Trees/acre	M	M	0	160	120	140	60

* = Species Was Present; M = Missing Data

VEGETATION

The establishment process for vegetation plots is unclear. From the notes and plans in the White Cap Box, the immpression emerged that vegetation plots were established when the Fritz Creek fire burned. However, original data sheets clearly indicate initial inventories within days after the Fritz Creek Fire for five plots. Whether the initial plots were located in burned or unburned areas is not documented. It is possible that the vegetation plots were put in while the fire was burning--some of the plots may have pre- and post fire data, others may not. It is hard to tell. A sixth plot (WC-06) was established in 1974 with fuel plot 1370 in the same stand. Vegetation plots were reinventoried yearly through 1980 using the continguous nested plot method developed during a vegetation succession study in areas burned by the 1967 Sundance fire. This method, described by Stickney (1980), measures three vascular plant catagories:

-- Trees,

-- Shrubs, and

-- Herbs,

for frequency of occurrence, percent cover and height by species. Additionally, non-vascular coverage was described by percent of rock, bare ground, litter, and moss and/or lichens. The raw plot data were reduced by unidentified computer program(s) that produced tabular summaries of height, percent cover, and volume for each stand by specied and year. Volumes were estimated from height and percent cover values. Appendix D illustrates the reports generated by this program whose summary sheets provide the basis for discussion of plant succession in this report. Vegetation plot attributes are described in table 10.

Table 10: Attributes of six permanent White Cap Vegetation Plots.

Area	WC-01	WC-02	WC-03	WC-04	WC-05	WC-06
Aspect	45	290	260	350	70	200
Slope	70	60	60	40	65	78
Elev	3600	3950	3900	5280	5100	3600
Years	73-80	73-80	73-80	73-80	73-80	74-77,79-80

As with fuels, vegetation data also had a few inconsistancies. Most noteable are patterns of occurrence of various shrub and herb species from year to year. Do these shrubs really vanish for a year or two at a time or is it a function of field crews or time of inventory? In identifing herbaceous species, almost thirty percent of the entries were coded as non-specific. Finally, tree regeneration coverage varied considerably from year to year at one of the two plots were seedlings were recorded.

A complete summary of the vegetation data (trees, shrubs, herbs, and non-vascular) is presented in tables E-1 through E-6 (percent cover) and E-7 through E-12 (volume) in Appendix E. Graphic summaries of total coverage and volume from the tables for plots WC-01, 02, 03, 04, and 05 are depicted in figures 9 and 10 for shrubs, and figures 11 and 12 for herbaceous material.

Figures 9 and 10 show sharp declines of shrub coverage and volume in 1974, except at area 05 which was the only area without shrubs in 1974. Looking at the 1975 through 1980 trends at area 05, I suspect a bad 1973 inventory. Areas 01, 02, and 03 all decreased in shrub cover and volume from 1973 to 1980, while cover and volume increased at areas 04 and 05. Area 05 had the greatest increase in shrubs volume, and area 03 lost almost all of its shrub coverage and volume.

Figures 11 and 12 summarize total herbaceous cover and volume, respectively at areas 01, 02, 03, 04, and 05. Only area 04 recorded any herbaceous growth in the initial 1973 inventory. All areas increased in percent cover to values between 15 and 28 percent by 1974. Percent covers were then fairly constant through 1980 (except at area 04 where steady increases were noted), with all areas recording a one-time dip in cover and volume in 1979. The dip seems a little suspicious, but could be due to a particulary dry year, or early inventory. Over the course of the study, herbaceous volume increased at each vegetation plot. At area 04, the volume increase was over 700 percent, from .7 to 7.8 cubic meters per hundreth hectare. Comparable increases were noted at each of the other areas that had no herbaceous

White Cap Vegetation - Shrub Cover

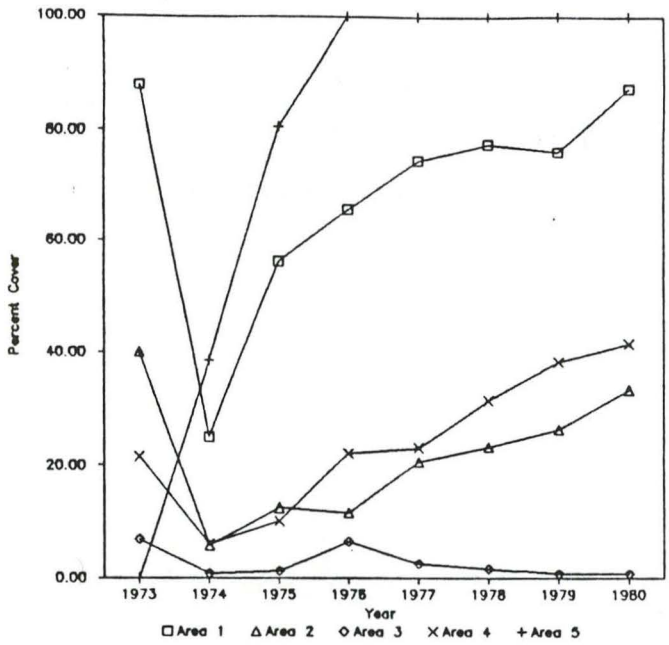

Figure 9 : White Cap Vegetation - Shrub Cover

White Cap Vegetation - Shrub Volume

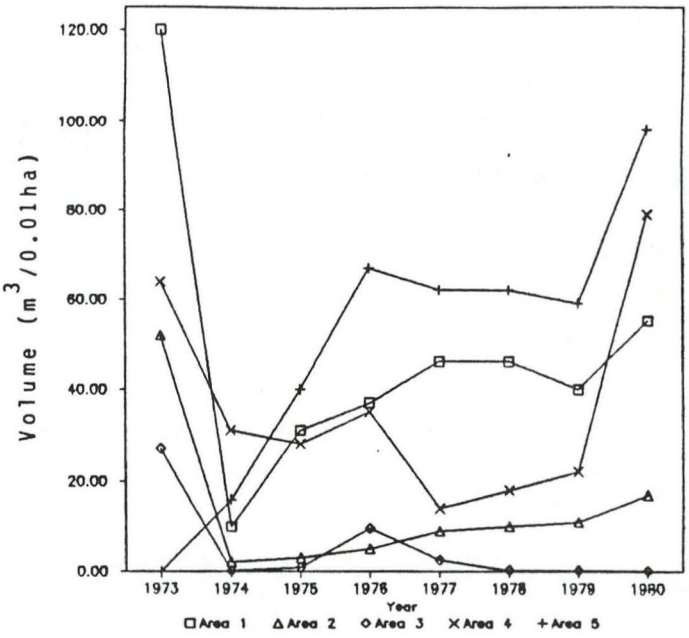

Figure 10 : White Cap Vegetation - Shrub Volume

White Cap Vegetation - Herbaceous Cover

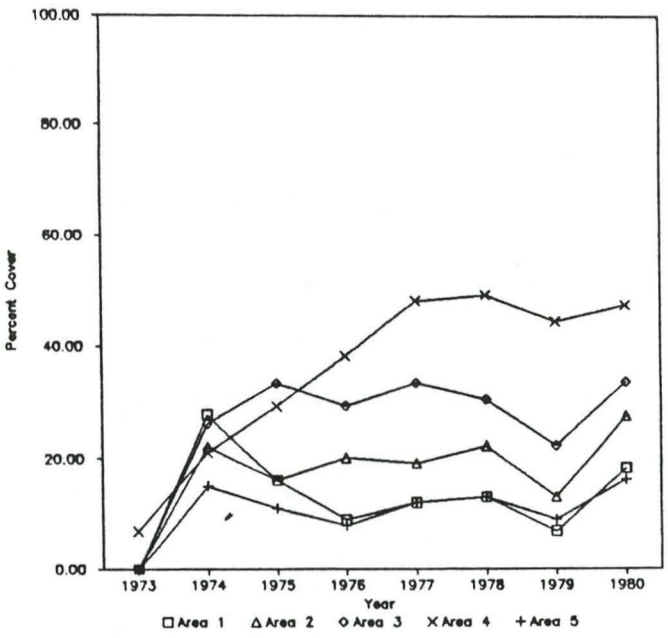

Figure 11 : White Cap Vegetation - Herbaceous Cover

White Cap Vegetation - Herbaceous Volume

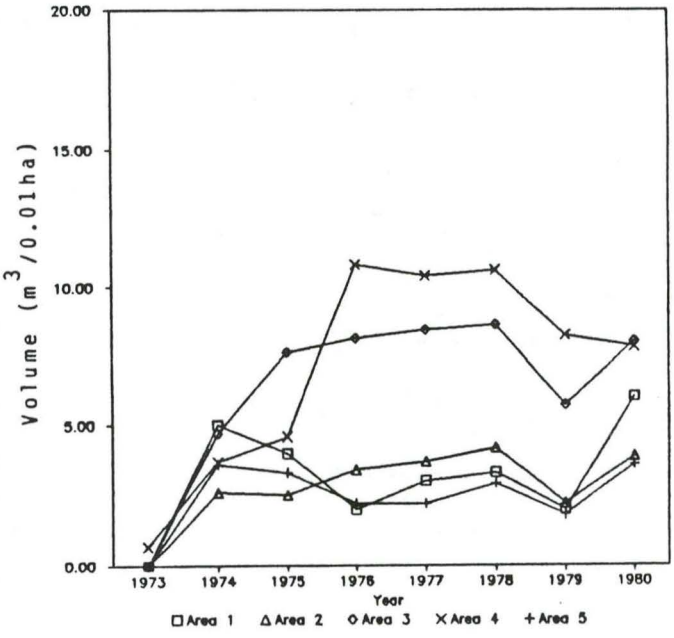

Figure 12 : White Cap Vegetation - Herbaceous Volume

materials in 1973.

The first year variations in shrubs and herb conflict with the same responses at the fuel plots. The decline in shrubs suggests the initial 1973 inventory before the area was burned. However, first year increase in herbaceous coverage is opposite that of herbaceous at the fuel plots--the zero values suggest an inventory after the area was burned.

Non-vascular ground coverage was almost the exact inverse of herbaceous coverage. It was 100 percent at each area but 04 in 1973, and dropped through the course of the study. When herbaceous cover dropped at all areas in 1979, non-vascular coverge increased by proportional amounts.

Detailed occurrence checklists by species, area and year are provided in tables 12 and 13 for shrubs and herbs, respectively. The species are ranked in the tables by frequency of occurrence. For ease of reading the area number is used to indicate a species occurring at an area for any year. At the bottom of each year/area column is the total number of species recorded at the area for the year, and below that is the number of different species recorded at the six areas for the year. The right portion of the table contains species occurrence summaries--the number of years a species was recorded at each area, the total number of occurrences of a species, the percentage frequency of occurrence in all plots/years, and the percentage frequency of occurrence of the species in the database.

Looking at shrubs first (table 12) we see that 85 percent of the plot/year inventories contained White Spirea--the most common shrub among the plots and accounting for 18 percent of the inventoried shrubs. Over one-half the plots also recorded Ninebark and/or Snowberry, while Elderberry and Alder were noted only once through the entire inventory. Sixteen different shrub species were recorded at the six areas. Areas 05 and 06 had the greatest diversity of shrubs and areas 02 and 03 had the least. 1979 recorded the most different shrub species (14) while 1974 had the least (9), a rather limited range.

The herbaceous checklist (table 13) reveals a more significant increase in

Table 11: Shrub Species Occurrence Checklist and Summary Table - White Cap Study Area

Shrub Species Occurrence Checklist by Year, Area, and Species																									N. Years by Area						Row Total	Row Pct/ Col Pct
	1973					M	1974						1975						1976						1977						1978					M	1979						1980												
Shrub Species	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6		
White Spirea				4			1	2	3			6	1	2	3		5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5		1	2	3	4	5	6	1	2	3	4	5	6	7	7	7	6	6	6	39	85/ 18
Ninebark	1	2					1	2			5	6	1	2			5	6	1	2			5	6	1	2			5	6	1	2			5		1	2			5	6	1	2			5	6	8	8	0	0	7	6	31	67/ 14
Snowberry	1	2					1	2			5	6	1	2			5	6	1	2			5	6	1	2			5	6	1	2			5		1	2			5	6	1	2			5	6	8	8	0	0	7	6	29	63/ 13
Serviceberry		2		4							5	6					5	6				4	5	6				4	5	6				4	5					4		6	1			4	5	6	1	1	0	6	6	6	20	43/ 9
Rose Spp.	1						1					6	1					6	1					6	1				5	6	1				5		1				5	6	1				5	6	8	0	0	0	4	6	18	39/ 8
Mock Orange	1		3									6	1		3			6			3			6	1		3			6	1						1					6	1					6	6	0	4	0	0	6	16	35/ 7
Mtn. Maple				4						4	5					4	5					4	5					4							5		1				5	6	1			4	5	6	2	0	0	6	6	2	14	30/ 6
Ceanothus												6						6					5	6					5	6	1				5		1				5	6	1	2			5	6	3	1	0	0	5	5	14	30/ 6
Mtn. Willow				4																		4	5					4	5						5		1				5	6				4	5		0	0	0	6	5	1	12	26/ 5
Thimbleberry				4						4						4						4						4							5		1				5	6				4			0	0	0	8	0	1	9	20/ 4
Huckleberry				4						4						4						4													5		1				5	6							0	0	0	6	0	0	6	13/ 3
Ocean Spray																										2				6		2												1	2					1	3	0	0	0	1	5	11/ 2
Honeysuckle										4						4																			5		1				5	6				4			0	0	0	4	0	0	4	9/ 2
Mensiesia				4																															5		1				5	6				4			0	0	0	3	0	0	3	7/ 1
Elderberry																								6																									0	0	0	0	0	1	1	2/ <1
Alder																					5																											0	0	0	0	1	0	1	2/ <1
Number Species	4	3	1	7	0	M	4	3	1	3	4	6	5	3	2	4	5	7	4	3	2	7	8	7	5	4	2	6	7	9	6	4	1	4	8	M	7	3	1	7	7	10	9	5	1	7	8	8	44	28	11	45	47	47	222	
Number Different Species/Year	11 **						9						11						13						13						11 **						14						13												

M = Area Not Inventoried That Year; ** = Sums Include Uninventoried Area

Row Percentage is Percentage of Occurrance By Plots (i.e., White Spirea was found in 85% of the Vegetation Plots.)

Column Percentage is Percent Occurrence From Inventory Data Base. (i.e. White Spirea accounted for 18% of the Shrub Species Inventoried.)

Table 12: Herbaceous Species Occurrence Checklist and Summary Table - White Cap Study

Herbaceous Species Occurrence Checklist by Year, Area, and Species

Herb Species	1973 (1 2 3 4 5 M)	1974 (1 2 3 4 5 6)	1975 (1 2 3 4 5 6)	1976 (1 2 3 4 5 6)	1977 (1 2 3 4 5 6)	1978 (1 2 3 4 5 M)	1979 (1 2 3 4 5 6)	1980 (1 2 3 4 5 6)	N. Years by Area 1	2	3	4	5	6	Row Total	Row Pct/ Col Pct
Unspecified		1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5	1 2 3 4 5 6	1 2 3 4 5 6	7	7	7	7	7	6	41	89/ 27
Pine Grass		2 5	2 5	1 2 5	1 2 5	1 2 3 5	1 2 3 5 6	1 2 3 5 6	5	7	3	0	7	2	24	52/ 16
Aster		6	6	6	5 6	5	5 6	2 5 6	0	1	0	0	4	6	11	24/ 7
Fairy Bells	4	4	4	4	4	4	1 4	1 4	2	0	0	0	8	0	10	22/ 7
Broadleaf Arnica	4	4	1 4	4	4	4	4	4	1	0	0	0	8	0	9	20/ 6
Bear Grass	4	4	4	4	4	4	4		0	0	0	0	7	0	7	15/ 5
Balsamroot		3	3	3	3	3	3		0	0	6	0	0	0	6	13/ 4
Wheatgrass			3	3	3	3	3	3	0	0	6	0	0	0	6	13/ 4
Sandwort		5 6	1						1	0	0	0	1	1	3	7/ 2
Sedge				6	6		6		0	0	0	0	0	3	3	7/ 2
Elk Sedge					5	5	5		3	0	0	0	3	0	3	7/ 2
Goldthread	4					4			0	0	0	3	0	0	3	7/ 2
Fireweed				4		4		6	0	0	0	2	0	1	3	7/ 2
Clover		6					6	6	0	0	0	0	0	3	3	7/ 2
Bedstraw					2			6	0	1	0	0	0	1	2	4/ 1
Geranium		5 6							0	0	0	0	1	1	2	4/ 1
Miners Lettace		1 2							1	1	0	0	0	0	2	4/ 1
Knapweed				5		5			0	0	0	0	2	0	2	4/ 1
Everlasting			6						0	0	0	0	0	1	1	2/ 1
Heartleaf Arnica								2	0	1	0	0	0	0	1	2/ 1
Paintbrush				3					0	0	1	0	0	0	1	2/ 1
Strawberry								1	1	0	0	0	0	0	1	2/ 1
Idaho Fescue						3			0	0	1	0	0	0	1	2/ 1
Western Fescue							6		0	0	0	0	0	1	1	2/ 1
Hawkweed								2	0	1	0	0	0	0	1	2/ 1
Globemarrow								1	1	0	0	0	0	0	1	2/ 1
Dragonhead		6							0	0	0	0	0	1	1	2/ 1
Self heal			5						0	0	0	0	1	0	1	2/ 1
Pathfinder								2	0	1	0	0	0	0	1	2/ 1
Number Species	0 0 0 4 0 M	2 3 2 4 4 6	3 2 3 4 3 3	2 2 4 5 3 3	2 3 3 4 4 3	2 2 5 6 5 M	3 2 4 4 4 6	5 8 3 4 3 6	19	20	24	20	41	27	151	
Number Different Species/Year	4 **	11	10	12	11	13 **	13	16								

M = Area Not Inventoried That Year; ** = Sums Include Uninventoried Area
Row Percentage is Percentage of Occurrance By Plots (i.e., Unspecified Herbs were recorded in 89% of the Plots.)
Column Percentage is Percent Occurrence From Inventory Data Base. (i.e. Unspecified Herbs accounted for 27% of the Herb Inventoried.)

species diversity over the study period--beginning with 4 species at area 04 in 1973 and ending with 16 different species being recorded in 1980. Twenty-eight diffferent herbaceous species were indentified in the six areas. Unspecified species were the most prevelant, occurring in 89 percent of the plot/year inventories and accounting for 27 percent of the herbaceous database. Pine grass, the next most frequenct species was noted in just over half the plot/year inventories and accounted for another 16 percent of the database. Aster, Fairy Bells, Broadleaf Arnica, Bear Grass, Balsamroot, and Wheatgrass together comprised a third of the data base, while the remaining 21 species comprised the remaining quarter of the database in terms of frequency of occurrence.

SUMMARY

After a year or two of reduced biomass at each fuel stand, overall biomass at three of the fours fuels stands increased in the eight years following the Fritz Creek fire. Stand 70 which had extremely high duff and rotten loads in 1972 was the only stand to record reduced overall fuel load during the study. The only fuel components to remain below 1972 inventory levels at each stand were dead shrub and larger (3+ inch) rotten fuels. Live fuels (particularly herbs) and duff generally increased, while other components varied from year to year and from stand to stand. Dead fuels generally comprised about 95 percent of a stands biomass, live shrubs 3 to 4 percent, and herbaceous material about 1 percent. Live shrub biomass, and shrub and herbaceous coverage dropped sharply the first year after the fire and then increased steadily through 1980. Seedling regeneration was first recorded in 1974 or 75, and seemed sporadic except at stand 37 were yearly increases were noted.

All vegetation plots recorded significant increases in herbaceous material in the eight years after the fire. Seven species--Pine Grass, Aster, Fairy Bells, Broadleaf Arnica, Bear Grass, Balsamroot and Wheat Grass dominanted herbaceous regeneration. Shrubs also increased at all plots except WC-01. White Spirea, Ninebark, and Snowberry were the most often occurring shrubs. Diversity increased

from 1973 inventories for both herbs and shrubs. Seedling regeneration was recorded at only two vegetation plots, and like at the fuel stands, was sporadic from year to year.

With the year to year variation in fuel loads, it seems inappropriate to have much faith that the 1972 inventories truely characterize the pre-fire conditions at the fuel stands.

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Appendix A

Fire History of White Cap Study Area

from

Ecolocical Interpretations of the White Cap Drainage

A Basis for Wilderness Fire Management

David F. Aldrich and Robert Mutch

September 1972

Analysis of Fires Occurring in the White Cap
Study Area from 1926 through 1970 - 212 Fires

Prepared
By
W. L. DeZell

Lightning caused 206 of the 212 fires, or 97 percent. Of the other six fires, five were caused by careless smoking and one resulted from a hunter's cooking fire. Fifty-eight class "B" and larger fires burned 1,247 acres; man-caused fires burned 23.5 of these acres.

Fires in the study area occurred in the 6 months from May through October. Most of the fires occurred in July, August, and September.

	Percent of Occurrence		
Month	All fires	Class B & Larger	Class C,D, & E
May	1.4%	3%	15%
June	5.2%	5%	8%
July	35.8%	33%	46%
August	40.5%	30%	8%
September	15.1%	26%	15%
October	2 %	3%	8%
Total Fires	212	58	13

Fire occurrence ranged from a high of 19 in 1961 to 5 years in which there were no fires suppressed in the study area. The average number of fires in the area for the 45 years was 4.7. Analysis of the number of fires by individual years indicates the following:

In 19 of the 45 years (42%) there were 2 fires or less.

In 20 of the 45 years (44%) there were from 3 to 8 fires.

In 6 of the 45 years (14%) there were from 9 to 19 fires.

The earliest fire occurrence for the study period was May 13; the fire was a Class C and burned 90 acres. The latest fire occurrence was October 10, a Class B, man-caused fire which burned 3.5 acres. Multiple fire occurrence is frequent with as many as 9 fires starting in 1 day on September 3, 1942. There were several days when over 6 fires started.

Fires occurred at nearly all elevations. Larger fires tend to occur at lower elevations, with lower occurrence of larger fires in the 5,001 to 7,000-foot range as follows:

Elevation Range	Percent of All Fires	Percent of Class B & Larger	Percent of Class C, D, & E
3,000-4,000	6.1%	10.3%	23.0%
4,001-5,000	25.0%	24.1%	31.0%
5,001-6,000	14.1%	10.3%	8.0%
6,001-7,000	26.4%	22.5%	8.0%
7,001-8,000	23.2%	22.5%	15.0%
8,000+	5.2%	10.3%	15.0%
Number of Fires	212	58	13

We evaluated the time from origin to discovery and arrived at the following table:

Time from Origin to Discovery	Percent of All Fires	Percent of Class B & Larger	Percent of Class C, D, &E
0- 2 Hours	31.0%	20.0%	15.0%
2- 4 Hours	9.0%	7.0%	8.0%
4- 8 Hours	4.7%	4.0%	8.0%
8-24 Hours	24.5%	24.0%	31.0%
24-48 Hours	12.3%	14.0%	15.0%
48 Hours +	18.5%	31.0%	23.0%
Number of Fires	212	58	13

Fires were discovered by lookouts and other Forest Service employees with the air patrol becoming a major detection factor in more recent years. There were no fires reported by the general public in the 45-year period analyzed.

Because of the changes in fire report forms, we were unable to establish the position on slope of 60 fires. The following percentage figures apply to those analyzed:

Base or lower 1/3.....10%)
Middle 1/3.....43%) - 152 fires
Upper 1/3 or Top.....47%)

A comparison of the exposure fires occur as follows:

Exposure	Percent of All Fires		Percent of Class B & Larger		Percent of Class C, D, & E	
N	10.0%)		7.0%)		8.0%)	
NE	4.0%)	- 23%	2.0%)	- 16%	0.0%)	- 8%
NW	9.0%)		7.0%)		0.0%)	
S	27.0%)		29.0%)		23.0%)	
SE	11.0%)	- 56%	10.0%)	- 63%	15.0%)	- 69%
SW	18.0%)		24.0%)		31.0%)	
E	9.0%)		7.0%)		0.0%)	
W	11.0%)	- 21%	13.0%)	- 21%	15.0%)	- 23%
Valley Bottom	1.0%)		1.0%)		8.0%)	

Prevailing winds in the study area are from the southwest and may be a factor in larger fire occurrence on Southwest slopes.

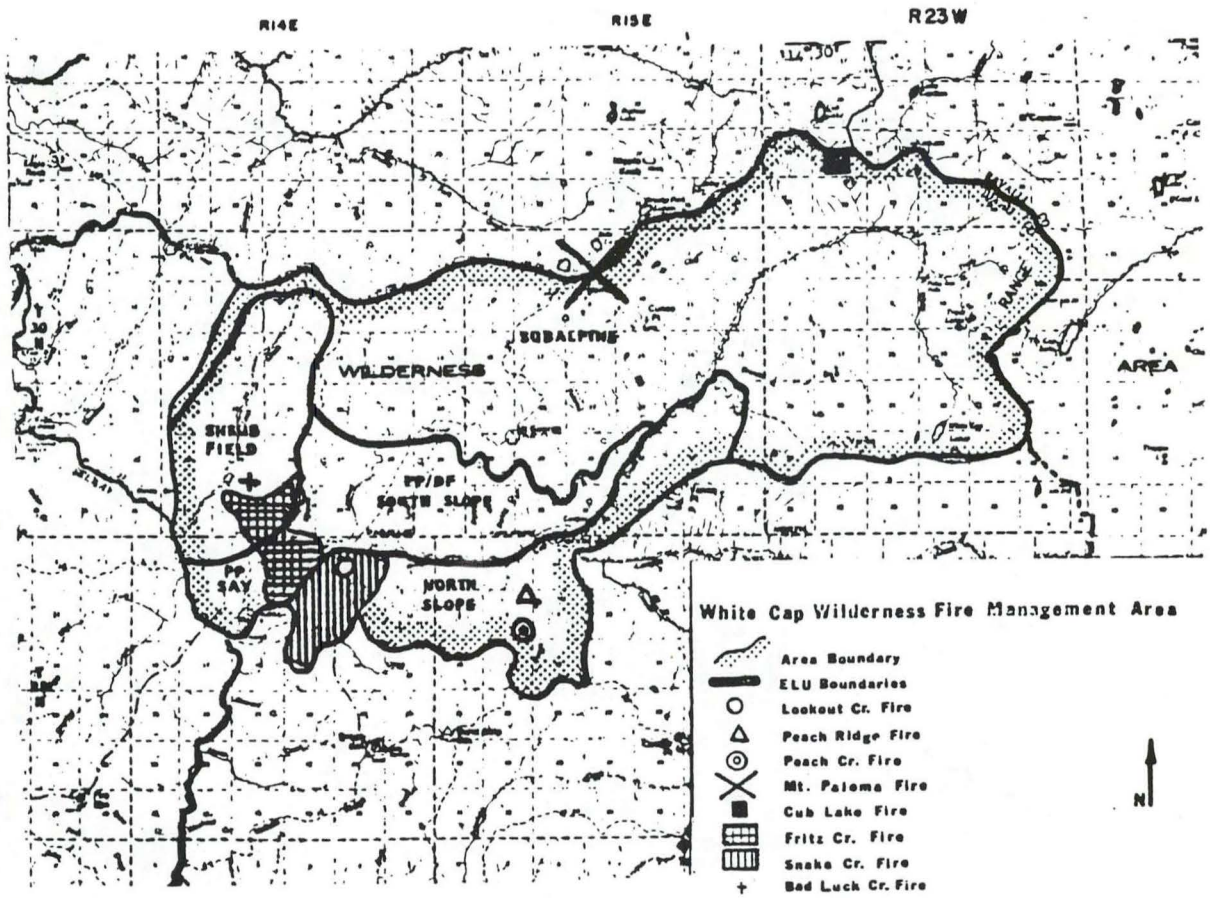
Evaluation of steepness of slope in relation to fire size:

Slope	All Fires	Class B & Larger	Class C, D, & E
0-20%	14%	5%	8%
21-40%	18%	17%	16%
41-60%	21%	26%	8%
61-80%	24%	24%	30%
81% +	22%	28%	38%
	212 Fires	58 Fires	13 Fires

Two things we wanted to consider but could not because of changes in fire records were fuels at point of origin and fire danger. Fuels at point of origin are not on the older individual fire reports. Fire danger ratings were either not shown or were expressed in a different form.

WILDERNESS FIRE MANAGEMENT PLAN

Management Zone	Suppression	Observation	Observation + Suppression
1. Shrubfield	a. Hunting season: BUI >170 b. Along study boundaries	a. Prehunting season b. Hunting season: BUI <170	Fires approaching Wapiti Creek Ridge
2. Ponderosa pine savanna		a. BUI <170	BUI >170
3. Ponderosa pine/Douglas-fir	a. <4,500' elevation	a. >4,500' elevation BUI <170	>4,500', BUI >170
4. North slope	a. Along study boundaries b. BUI >170: Peach Creek Drainage	a. West of Peach Creek Drainage b. Upper White Cap unit	BUI >170; fires approaching Peach Creek buffer
5. Subalpine	a. Along study boundaries b. BUI >170: Bitterroot Crest passes	a. Season-long	BUI >170: fires approaching Bitterroot Crest passes



Appendix B

White Cap Wilderness Fire Management Plan

Map of Study are and 1972-73 Fires

Discussion of 1972-73 Fire Events

from

The White Cap Box

FIRE SUMMARY - WHITE CAP WILDERNESS FIRE MANAGEMENT AREA 1972-1973

In August 1972, the fire management plan for the 66,000-acre White Cap and Bad Luck Creek area in the Selway-Bitterroot Wilderness was approved by the Chief of the Forest Service. The area is in the West Fork District of the Bitterroot National Forest of Region One. One small fire occurred during August 1972. The 1973 fire season was the first full season of application of the plan. 1973 was the driest summer on record at most reporting stations in Region One. During the period six fires occurred in the fire management area. This report summarizes the key information about those fires.

FIRE NAME	DATE		SIZE	FIRE MGT. ZONE	ACTION
	Start	Out			
1972					
Bad Luck Cr.	8/18	8/22	>¼ Ac.	Shrubfield	Observation
1973					
Peach Cr.	8/10	8/14	>¼ Ac.	North slope	*Observation & Suppression
Fritz Cr.	8/10	9/25	1200 Ac.	PP/Savanna PP/DF South slope Shrubfield	*Observation & Suppression
Lookout Cr.	8/10	8/16	>¼ Ac.	North slope	*Suppression
Cub Lake S-29	8/11	8/12	>¼ Ac.	Subalpine	Observation
Mt. Paloma	8/14	8/15	>¼ Ac.	Subalpine	Observation
Peach Ridge	9/6	9/13	>¼ Ac.	North slope	Observation

*Summaries describe action and reasons

BAD LUCK CREEK FIRE

The Bad Luck Creek fire started from lightning on August 18, 1972, in the Shrubfield fire management unit. The fire was observed from the air and on-the-ground for 4 days. It went out after burning an area 24 feet square.

FRITZ CREEK FIRE

The Fritz Creek fire started August 10, 1973, from a morning lightning storm. No precipitation fell on the area at the time of the storm.

The origin was in the PP/Savanna Ecological Land Unit (ELU). Fuels were light ground fuels associated with an open PP overstory with a grass and forb understory. Brush was present in draws and on more moist aspects.

Fire management prescriptions for the zone with the estimated BUI on the fire of 162 called for observation with suppression to stop the fire on the boundary between the PP/Savanna and the PP/DF southslope ELU's. The BUI at West Fork was 61.

Weather was seasonably hot and dry. Diurnal winds were the only appreciable winds on the fire until August 13. Between August 10 and August 12, the fire increased in size to 108 acres by spreading down onto the White Cap face and down into Wapiti Creek.

Based on anticipated behavior, a crew of seven men started linebuilding and burnout on the boundary between PP Savanna and PP/DF southslope ELU's during the afternoon of August 13. Winds increased to 20 m.p.h. with gusts of 30 m.p.h. all afternoon. Winds plus temperatures of 90° and relative humidity as low as 11 percent aided the spread of the fire across the line in two places and increased its total size to 400 acres.

On August 14, 80 men lined the fire area in the PP/DF southslope ELU and contained its spread in this direction. The fire expanded to the west and north to a total of 511 acres It burned into the brushfield ELU just northwest of Bad Luck Lookout and spotted and burned around in the dense LPP and DF reproduction. The fire management prescription provides for observation in the shrubfield ELU under the existing conditions. A B-17 load of retardent was used in conjunction with burnout to "fireproof" the Bad Luck Lookout site.

On August 15, the fire was quiet along the lined side and burnout operations secured the line. The fire expanded to the west and north to a total of 650 acres.

About 1730 that evening the Snake Creek Fire broke out across White Cap Creek from the Fritz Creek Fire. This fire was started by an undetected spot from the Fritz Creek Fire. Since the Snake Creek Fire was outside of the approved fire management area and had to be suppressed, we separated it from the Fritz Creek Fire and assigned separate overhead, personnel, and a camp to it.

The Snake Creek Fire lasted primarily from August 15 to August 21. It made significant runs on 2 days, then quieted down. Its final size when controlled was 1,600 acres.

Manpower on the Fritz Creek Fire was reduced to 44 on August 16 and to two on August 19. Fire spread was from 650 acres on August 15 to 877 acres on August 20 while the fire was being observed. On August 22 the fire advanced to 1,060 acres. All these increases were in brush grass and dense reproduction in the shrubfield ELU.

On August 23, 30 men were put on the fire to stop spread into the PP/DF southslope as prescribed in the fire management plan. On August 24, a .19-inch precipitation quieted the fire down and personnel were removed. The fire lay quiet, smoking on the edges until August 29.

On August 29, seven men worked on a 5-acre advance in the PP/DF southslope ELU. At the same time about 55 acres in the brushfield ELU burned

bringing the fire to a 1,120-acre total. The seven men spent 1 more day on the fire and came off in the morning of August 31 in a rainstorm which dropped .69 inches of rain.

On September 4, 6, and 13, the fire burned another 80 acres in the brushfield ELU to put the total fire size at 1,200 acres. No further ground action has been taken on the fire. Heavy rains occurred on September 14, 15, and 20.

Smoke was reported in the shrubfield on September 21, On September 28, no smoke could be seen on an observation flight.

PEACH CREEK FIRE

Peach Creek Fire also started August 10 and from the same storm as Fritz Creek. It was in the northslope community ELU. With the BUI below 170, the fire management prescription called for observation. Fuels were a downed log and pole-size subalpine fir on the site. On August 14, the fire was suppressed because the Schofield Fire outside the fire management area was threatening to burn into Peach Creek. The potential was also there for the Peach Creek Fire to escape the management area and join the Schofield Fire.

LOOKOUT CREEK FIRE

Lookout Creek lightning fire was also suspected as being caused by the August 10 lightning storm. It was discovered on August 16 by an IR flight and suppressed the same day because of the advancing Snake Creek Fire. It was approximately 2 chains in perimeter. The Snake Creek Fire burned over it later during burnout operations.

CUB LAKE FIRE

The Cub Lake section 29 fire was a lightning fire on the ridge above Cub Lake. It started August 11, did not spread, and was observed smoking last on August 12. It was in the subalpine ELU. The prescription called for observation. No suppression action was taken.

MT. PALOMA FIRE

The Mt. Paloma fire started August 14 by lightning. It was also in the subalpine ELU. It was observed according to prescription. Fuels consisted of a snag, a downed log, and beargrass. The fire was last seen smoking on August 15

PEACH RIDGE FIRE

The Peach Ridge Fire started September 6 from lightning. It was in the northslope ELU about 1/2 mile below the Peach Creek Fire. It was in moderately heavy fuels, consisting of downed trees, brush, and grass. The prescription called for observation. It spread from a small spot to a 2-chain perimeter fire. It was last observed smoking on September 13.

A more detailed report will be made on Fritz Creek and other fires this winter.

Orville L. Daniels

Appendix C

Sample Output From FUELS Biomass Program

STAND NUMBER 36

********** FUEL LOADING SUMMARY **********
(FOR 15 PLOTS)

SIZE CLASS	LOADING IN POUNDS/ACRE AVERAGE	STD-DEV	%ERROR	LB/SQ-FT
0-.25	271.	213.	20.3	.0062
.25-1	578.	438.	19.6	.0133
LITTER	1339.	382.	7.4	.0307
DEAD GRASS-FORB	18.	9.	13.6	.0004
FINES	2206.	577.	6.8	.0506
1-3	627.	1653.	68.1	.0144
CONES	279.	737.	68.1	.0064
LESS THAN 3	3111.	2217.	18.4	.0714
SOUND 3-6	576.	2231.	100.0	.0132
SOUND 6-10	1866.	7227.	100.0	.0428
SOUND 10-20	0.	0.	0.0	0.0000
SOUND 20+	0.	0.	0.0	0.0000
3+ SOUND TOTAL	2442.	7409.	78.3	.0561
ROTTEN 3-6	438.	1695.	100.0	.0100
ROTTEN 6-10	630.	2441.	100.0	.0145
ROTTEN 10-20	0.	0.	0.0	0.0000
ROTTEN 20+	0.	0.	0.0	0.0000
3+ ROTTEN TOTAL	1068.	2871.	69.4	.0245
DUFF	3993.	3083.	19.9	.0917
DEAD BRUSH	172.	567.	60.1	.0040
DEAD FUEL LOAD	10787.	8446.	20.2	.2476
LIVE GRASS-FORB	55.	29.	13.6	.0013
LIVE BRUSH	1213.	2488.	37.4	.0278
NEEDLES (SEED)	0.	0.	0.0	0.0000
0-.25	0.	0.	0.0	0.0000
.25-1	0.	0.	0.0	0.0000
TOTAL REGEN.	0.	0.	0.0	0.0000
TOTAL FUEL LOAD	12054.	8272.	17.7	.2767

********** FUEL DEPTH SUMMARY **********
(IN INCHES)

CLASS	AVERAGE BY FUEL TYPE WHEN PRESENT GRASS	HERBACEOUS	SHRUB	LITTER	TWIGS	AVERAGE BY PLOT
GREEN DEPTH	0.00	0.00	0.00			10.82
DEAD DEPTH	0.00	0.00	0.00	0.00	0.00	6.80

	AVERAGE	MINIMUM	MAXIMUM	STD-DEV
DUFF	.22	0.00	1.00	.22
BRUSH	17.93	0.00	92.00	17.36

********** STAND CONDITIONS **********

	AVERAGE	MINIMUM	MAXIMUM	STD-DEV
AGE	0.	0.	0.	0.
CROWN BASE	0.0	0.0	0.0	0.0

STAND NUMBER 36

********** TOPOGRAPHIC CONDITIONS **********

	AVERAGE	MINIMUM	MAXIMUM	STD-DEV
SLOPE	78.7	75.0	80.0	2.29
ASPECT	282.0			
ELEVATION	3775.	3750.	3800.	21.0

******* AVERAGE LIVE AND DEAD SHRUB LOADINGS IN POUNDS/ACRE *******
(FOR 30 PLOTS)

	SIZE CLASS IN CENTIMETERS							
SPECIES	0-.5	.5-1	1-1.5	1.5-2	2-3	3-5	5+	TOTAL
SERVICEBERRY	28.9	60.2	88.8	0.0	0.0	0.0	0.0	177.9
NINEBARK	12.5	40.4	0.0	0.0	0.0	0.0	0.0	52.9
OCEANSPRAY	13.4	89.3	604.6	171.0	0.0	0.0	0.0	878.3
SNOWBERRY	75.9	68.8	0.0	0.0	0.0	0.0	0.0	144.7
ROSE	12.9	0.0	0.0	0.0	0.0	0.0	0.0	12.9
W. SPIREA	23.6	12.5	60.7	0.0	0.0	0.0	0.0	96.7
OREGONGRAPE	19.4	2.4	0.0	0.0	0.0	0.0	0.0	21.9
TOTAL	186.6	273.6	754.0	171.0	0.0	0.0	0.0	1385.3

	BY BRUSH CLASS						
	LOW	MEDIUM	HIGH	UNDEFINED	LIVE	DEAD	TOTAL
LOADING	276.2	931.2	177.9	0.0	1212.9	172.3	1385.

***** PERCENTAGE ESTIMATES ********* 3+ VOLUME AND DIAMETER *****

BRUSH		GRASS-FORBS		SOUND		ROTTEN	
%COVER	%DEAD	%COVER	%DEAD	CU-FT	AVG.DIA	CU-FT	AVG.DIA
12.1	8.7	6.6	23.2	98.	7.00	57.	5.50

********** SEEDLING COUNT **********

SPECIES	TREES/ACRE	AVG.HT.IN.
TOTAL	0.	

Appendix D

Sample Output from Vegetation Summary Program

COVER -- POSTBURN DEVELOPMENT

STUDY WHITECAP AREA 1

SUCCESSION	1	2	3	4	5	6	7	8
CALENDAR	1973	1974	1975	1976	1977	1978	1979	1980
TREES	0.	0.	0.	0.	0.	0.	0.	0.
101.	0.	0.	0.	0.	0.	0.	0.	0.
175.	0.	0.	0.	0.	0.	0.	0.	0.
SHRUBS	87.46	24.95	56.12	65.51	74.18	76.8	75.8	87.0
203.	0.	0.	0.	0.	0.	0.	0.1	0.2
215.	0.	0.	0.	0.	0.	0.	0.	0.5
227.	0.	0.	0.	0.	0.	0.8	2.0	4.7
256.	0.	0.	0.	0.	0.	0.	0.	0.8
277.	20.83	0.	1.04	0.	1.04	2.3	5.5	0.8
280.	65.00	6.13	31.46	26.33	26.42	32.4	17.2	27.1
329.	0.	0.62	1.67	1.66	4.56	0.	2.9	2.9
331.	0.55	0.	0.	0.	0.	3.2	0.	0.
365.	0.	9.02	3.19	5.52	8.01	4.2	10.0	14.5
370.	1.08	9.18	18.76	32.00	34.15	34.0	38.2	35.6
HERBS	0.	27.48	15.82	9.15	12.48	13.3	6.6	18.3
33.	0.	14.99	14.16	6.66	9.99	10.8	1.7	6.7
457.	0.	0.	0.83	0.	0.	0.	0.	0.
465.	0.	0.	0.83	0.	0.	0.	0.	0.
520.	0.	0.	0.	2.49	2.49	2.5	4.2	6.7
603.	0.	0.	0.	0.	0.	0.	0.8	5
638.	0.	0.	0.	0.	0.	0.	0.	1.7
699.	0.	0.	0.	0.	0.	0.	0.	0.8
750.	0.	12.49	0.	0.	0.	0.	0.	0.
NON-VASC	99.98	57.48	50.80	44.98	43.31	40.8	57.5	38.3
11.	4.99	5.83	4.16	1.66	1.66	2.5	2.5	2.5
12.	18.33	21.66	31.66	21.66	22.49	24.2	25.8	17.5
22.	76.66	29.99	12.49	21.66	19.16	14.2	29.2	18.3
44.	0.	0.	2.49	0.	0.	0.	0.	0.
TOTAL VASC	87.46	52.43	71.94	74.66	86.66	90.1	82.5	105.3

VOLUME -- POSTBURN DEVELOPMENT

STUDY WHITECAP AREA 1

SUCCESSION	1	2	3	4	5	6	7	8
CALENDAR	1973	1974	1975	1976	1977	1978	1979	1980
TREES	0.	0.	0.	0.	0.	0.	0.	0.
101.	0.	0.	0.	0.	0.	0.	0.	0.
175.	0.	0.	0.	0.	0.	0.	0.	0.
SHRUBS	120.77	10.25	31.20	36.74	45.95	46.4	47.2	55.2
203.	0.	0.	0.	0.	0.	0.	0.0	0.1
215.	0.	0.	0.	0.	0.	0.	0.	0.3
227.	0.	0.	0.	0.	0.	0.2	0.7	3.1
256.	0.	0.	0.	0.	0.	0.	0.	0.3
277.	27.72	0.	0.73	0.	1.25	2.5	7.8	1.0
280.	92.14	4.05	21.14	19.99	24.79	23.1	16.4	28.1
329.	0.	0.34	1.00	0.91	3.14	0.	1.9	2.0
331.	0.27	0.	0.	0.	0.	2.3	0.	0.
365.	0.	2.04	1.29	1.67	1.85	1.2	2.4	3.2
370.	0.64	3.82	7.04	14.17	14.92	17.0	18.0	17.0
HERBS	0.	3.82	3.40	1.44	2.32	2.8	1.1	3.6
33.	0.	2.41	3.20	0.99	1.99	2.3	0.2	1.2
457.	0.	0.	0.04	0.	0.	0.	0.	0.
465.	0.	0.	0.16	0.	0.	0.	0.	0.
520.	0.	0.	0.	0.45	0.33	0.5	0.7	1.6
603.	0.	0.	0.	0.	0.	0.	0.2	0.5
638.	0.	0.	0.	0.	0.	0.	0.	0.2
699.	0.	0.	0.	0.	0.	0.	0.	0.2
750.	0.	1.41	0.	0.	0.	0.	0.	0.
NON-VASC	0.	0.	0.	0.	0.	0.	0.	0.
11.	0.	0.	0.	0.	0.	0.	0.	0.
12.	0.	0.	0.	0.	0.	0.	0.	0.
22.	0.	0.	0.	0.	0.	0.	0.	0.
44.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL VASC	120.77	14.07	34.60	38.18	48.27	49.1	48.3	58.8

Appendix E

Checklist of Vegetation Species Codes

Percent Cover Summary Tables for Vegetation Plots

Volume Estimate Summary Tables for Vegetation Plots

Species Code	Latin Name	Common Name
	TREES	
101	Snagious Ferme	Burned Snag
104	Abies Grandies	Grand Fir
152	Pinus Contorta	Lodgepole Pine
158	Pinus Ponderosa	Ponderosa Pine
175	Pseudotsuga-Menziesii	Douglas Fir
	SHRUBS	
203	Acer Glabrum	Rocky Mountain Maple
208	Alnus Incana	Alder
215	Amelanchier Annifolia	Serviceberry
227	Ceanothus Sanguireus	Redstem Ceanothus
256	Holodiscus Discolor	Ocean Spray
265	Lonicera Utahensis	Honeysuckle
270	Mensiesia Ferruginea	Mensiesia
277	Philadelphus Lewisii	Mock Orange
280	Physocarpus Malvaceous	Ninebark
329-331	Rosa Species	Rose Hip
341	Rubus Parvilorus	Thimbleberry
345-346	Salix Species	Willow
356	Sambucus Racemosa	Elderberry
365	Spirea Butulifolia	White Spirea
370	Symphoricarpas Albus	Common Snowberry
381-382	Vaccinium	Huckleberry
	HERBS	
33	Unspecified Herbs	
408	Adenocaulon Bicolor	Pathfinder
421	Agropyron Spicatum	Blue Bunch Wheatgrass
430	Anaphalis Margaritaceau	Pearly Everlasting
457	Anenaria Macrophylla	Sandwort
462	Arnica Cordifolia	Heartleaf Arnica
465	Arnica Latifolia	Broadleaf Arnica
471	Aster Conspicuus	Conspicous Aster
502	Balsamorhiza Sagittata	Arrowleaf Balsamroot
520	Calamagrostis Rubescens	Pine Grass
533	Carex Concinnoides	Sedge
536	Carex Geyeri	Elk Sedge
555	Castilleja Species	Indian Paintbrush
558	Centaurea Macubsa	Thistle, Knapweed
584	Coptis Occidentalis	Goldthread
603	Disporum Trachycarpum	Fairy Bells
604	Disporum Hookeria, Oreganum	Fairy Bells
620	Epilobium Angustifolium	Common Fireweed
631	Festura Idahoensis	Idaho Fescue
632	Festura Occidentalis	Western Fescue
638	Frayaria Vesa	Wild Strawberry
649	Galium Triflorum	Sweet Scented Bedstraw
654	Geranium Bicknellii	Bicknell Geranium
685	Hieracium Albiflorum	Hawkweed
699	Illiamna Rivularis	Illiamna, Globemarrow
748	Moldavica Fistulosa	Dragonhead
750	Montia Uniflora	Miners Lettace
800	Prunella Vulgaris	Self-Heal
879	Tralorium Repens	Clover
907	Xerophyllum Tenax	Bear Grass

NON-VASCULARS

11 = Rock; 12 = Bare Ground; 22 = Litter; 44 = Moss and Lichens

Table E1:
White Cap Vegetation Succesion Data - Area 1, Percent Cover

	1973 Cover	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1978 Cover	1979 Cover	1980 Cover	Percent Change
				Shrubs					
Mtn. Maple							0.1	0.2	20%
Serviceberry								0.5	50%
Redstem Ceanothus						0.8	2.0	4.7	470%
Oceanspray								0.8	80%
Mock Orange	20.8	0.0	1.0		1.0	2.3	5.5	0.8	-96%
Ninebark	65.0	6.1	31.5	26.3	26.4	32.8	17.2	27.1	-58%
Rose Hip	1.0	0.6	1.7	1.7	4.6	3.2	2.9	2.9	190%
White Spirea	0.0	9.0	3.2	5.5	8.1	4.2	10.0	14.5	1450%
Snowberry	1.1	9.2	18.8	32.0	34.2	34.0	38.2	35.6	3196%
Total Cover	87.9	25.0	56.2	65.5	74.3	77.3	75.9	87.1	-1%
				Herbs					
Unspecified	0.0	15.0	14.0	6.6	9.9	10.8	1.7	6.7	670%
Sandwort	0.0		0.8						0%
Arnica (Broad)	0.0		0.8						0%
Pine Grass	0.0			2.5	2.5	2.5	4.2	6.7	670%
Fairy Bells	0.0						0.8	2.5	250%
Strawberry	0.0							1.7	170%
Globemarrow	0.0							0.8	80%
Miners Lettace	0.0	12.5							0%
Total Cover	0.0	27.5	15.6	9.1	12.4	13.3	6.7	18.4	1840%
				Non-Vascular					
Rock	5.0	5.8	4.2	1.7	1.7	2.5	2.5	2.5	-50%
Bare Ground	18.3	21.7	31.7	21.7	22.5	24.2	25.0	17.5	-5%
Litter	76.8	30.0	12.5	21.7	19.2	14.2	29.0	18.3	-76%
Moss/Lichens			2.5						0%
Total Cover	100.1	57.5	50.8	45.0	43.4	40.9	56.5	38.3	-62%

Table E-2:
White Cap Vegetation Succesion Data - Area 2, Percent Cover

	1973 Cover	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1978 Cover	1979 Cover	1980 Cover	Percent Change
Trees									
Douglas Fir		4.2		2.5	2.5	2.5	2.5	2.5	250%
Total Cover	0.0	4.2	0.0	2.5	2.5	2.5	2.5	2.5	250%
Shrubs									
Serviceberry	0.8								-83%
Redstem Ceanothus								0.3	30%
Oceanspray					0.8	0.8		2.1	210%
Ninebark	36.6	2.1	2.5	4.4	5.9	6.9	3.7	4.9	-87%
White Spirea		0.8	4.2	0.8	3.3	5.0	6.7	4.2	420%
Snowberry	2.6	3.1	6.0	6.7	10.6	10.6	16.0	21.8	738%
Total Cover	40.0	6.0	12.7	11.8	20.6	23.3	26.4	33.3	-17%
Herbs									
Unspecified	0.0	16.7	14.2	17.5	15.0	20.0	10.0	18.3	1830%
Pathfinder	0.0							1.7	170%
Heartleaf Arnica	0.0							0.8	80%
Conspicous Aster	0.0							0.8	80%
Pine Grass	0.0	0.8	1.7	2.5	3.3	1.7	3.3	1.7	170%
Sweet Bedstraw	0.0				0.8				0%
Hawkweed	0.0							3.3	330%
Miners Lettace	0.0	4.6							0%
Total Cover	0.0	22.1	15.8	20.0	19.1	21.7	13.3	26.6	2660%
Non-Vascular									
Bare Ground	4.2	18.3	23.3	10.0	17.5	7.5	9.2	5.0	20%
Litter	95.0	48.3	50.0	57.5	46.7	51.7	57.5	48.3	-49%
Moss/Lichens	0.8	2.5				0.8		0.8	-3%
Total Cover	100.0	69.2	73.3	67.5	64.2	60.0	66.7	54.1	-46%

Table E-3:
White Cap Vegetation Succesion Data - Area 3, Percent Cover

	1973 Cover	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1978 Cover	1979 Cover	1980 Cover	Percent Change
Shrubs									
Mock Orange	7.1		0.5	5.9	1.8			0.0	-100%
White Spirea	0.0	0.8	0.8	0.8	0.8	1.7	0.8	0.8	80%
Total Cover	7.1	0.8	1.3	6.7	2.7	1.7	0.8	0.8	-89%
Herbs									
Unspecified	0.0	9.2	5.8	4.2	9.2	0.8	0.8	5.8	580%
Blue Bunch Wheatgrass	0.0		0.8	1.7	2.5	0.8	3.3	2.5	250%
Arrowleaf Balsmroot	0.0	16.7	25.8	22.5	21.7	26.7	18.3	24.2	2420%
Pine Grass						0.8			0%
Indian Paintbrush	0.0			0.8					0%
Idaho Fescue	0.0					0.8			0%
Total Cover	0.0	25.8	32.5	29.1	33.3	29.9	22.4	32.5	3250%
Non-Vascular									
Rock	0.0	1.7	0.8	0.8	0.0	0.0	0.0	0.0	0%
Bare Ground	33.3	55.8	35.0	30.8	23.3	20.0	20.0	19.2	-42%
Litter	66.7	15.8	30.8	38.3	42.5	47.5	56.7	47.5	-29%
Total Cover	100.0	73.3	66.7	70.0	65.8	67.5	76.7	66.7	-33%

Table E-4:
White Cap Vegetation Succesion Data - Area 4, Percent Cover

	1973 Cover	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1978 Cover	1979 Cover	1980 Cover	Percent Change
Trees									
Lodgepole Pine	2.5	0.0	2.5	2.5	0.0	2.5	2.5	0.0	-100%
Douglas Fir	1.7	0.0	1.7	0.8	0.8	0.8	2.5	0.0	-100%
Total Cover	4.2	0.0	4.2	3.3	0.8	3.3	5.0	0.0	-100%
Shrubs									
Mtn. Maple	10.5	5.9	3.4	3.4	0.1	0.0	0.0	5.5	-47%
Serviceberry	1.9	0.0	0.0	1.2	2.1	0.6	1.8	3.4	76%
Honeysuckle	0.0	0.0	1.7	3.3	0.0	0.0	2.6	3.5	350%
Menzesia	4.3	0.0	0.0	0.0	0.0	0.0	0.4	0.4	-91%
Thimbleberry	0.6	0.2	3.3	12.0	14.4	24.2	25.5	23.6	2305%
Mtn. Willow	2.5	0.0	0.0	0.1	0.1	0.3	0.1	0.2	-92%
White Spirea	0.7	0.0	0.0	1.1	5.5	5.1	6.4	4.9	421%
Common Snowberry	0.0	0.0	0.0	.0	0.9	1.2	0.0	0.0	0%
Huckleberry	1.0	0.2	2.0	1.0	0.1	0.0	1.4	0.0	-100%
Total Cover	21.5	6.3	10.4	22.1	23.1	31.4	38.2	41.5	93%
Herbs									
Unspecified	0.0	8.3	5.8	6.7	5.8	0.8	3.3	6.7	670%
Broadleaf Arnica	2.5	7.5	17.5	20.0	27.5	34.2	35.8	31.7	1173%
Goldthread	1.7	0.0	0.0	0.0	0.0	0.8	0.0	0.8	80%
Fairy Bells	1.7	4.2	5.0	10.0	14.1	10.8	4.2	7.5	352%
Common Fireweed	0.0	0.0	0.0	0.8	0.0	1.7	0.0	0.0	0%
Bear Grass	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.0	-83%
Total Cover	6.6	20.8	29.1	38.3	48.3	49.1	44.1	46.7	603%
Non-Vascular									
Rock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	420%
Bare Ground	0.8	3.3	0.8	0.0	0.8	0.0	2.5	0.0	-83%
Litter	87.5	75.9	59.2	47.5	36.7	30.0	31.7	31.7	-64%
Moss/Lichens	0.0	0.0	0.0	0.0	0.8	0.8	0.0	2.5	250%
Total Cover	88.3	79.2	60.0	47.5	38.3	30.8	34.2	38.4	-57%

Table E-5:
White Cap Vegetation Succesion Data - Area 5, Percent Cover

	1973 Cover	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1978 Cover	1979 Cover	1980 Cover	Percent Change
				Shrubs					
Mtn. Maple	0.0	0.1	0.8	2.0	0.0	3.1	3.6	7.4	740%
Mtn. Alder	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0%
Serviceberry	0.0	0.1	1.0	2.9	2.1	0.2	0.0	1.0	100%
Redstem Ceanothus	0.0	0.0	0.0	1.4	2.3	7.0	21.3	47.5	4750%
Ninebark	0.0	33.0	70.7	100.7	83.6	70.4	46.3	53.1	5310%
Rose Hip	0.0	0.0	0.0	0.0	0.1	0.4	0.6	1.0	100%
Mtn. Willow	0.0	0.0	0.0	0.5	1.0	2.6	3.5	2.9	290%
White Spirea	0.0	0.0	1.0	2.8	9.0	7.0	7.3	7.2	720%
Common Snowberry	0.0	5.4	7.0	7.4	10.3	15.7	15.5	16.1	1610%
Total Cover	0.0	38.5	80.5	118.8	108.3	106.4	98.1	136.2	10000%
				Herbs					
Unspecified	0.0	10.0	9.2	4.2	5.8	5.0	2.5	6.7	670%
Sandwort	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0%
Conspicous Aster	0.0	0.0	0.0	0.0	0.8	1.7	2.5	2.5	80%
Pine Grass	0.0	0.8	0.8	2.5	3.3	3.3	3.3	6.7	670%
Elk Sedge	0.0	0.0	0.0	0.0	1.7	1.7	0.8	0.0	0%
Thistle	0.0	0.0	0.0	0.8	0.0	0.8	0.0	0.0	
Bicknell Geranium	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	
Self-heal	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0%
Total Cover	0.0	15.0	10.8	7.5	11.7	12.5	9.1	15.9	1590%
				Non-Vascular					
Rock	0.0	2.5	0.8	0.0	0.0	0.8	0.8	0.0	0%
Bare Ground	68.3	53.3	33.3	24.2	20.8	20.8	31.7	37.5	-45%
Litter	31.7	6.7	0.8	0.0	1.7	0.0	13.3	3.3	-90%
Total Cover	100.0	62.5	35.0	24.2	22.5	21.6	45.8	40.8	-59%

Table E-6:
White Cap Vegetation Succesion Data - Area 6, Percent Cover

	1974 Cover	1975 Cover	1976 Cover	1977 Cover	1979 Cover	1980 Cover	Percent Change
Shrubs							
Mtn. Maple	0.0	0.0	0.0	0.0	2.4	3.1	310%
Serviceberry	1.4	2.3	0.4	1.9	0.6	2.4	78%
Redstem Ceanothus	0.0	1.3	1.1	1.2	1.7	4.0	400%
Ocean Spray	0.0	0.0	0.0	0.3	0.0	0.0	0%
Mock Orange	2.7	11.0	9.7	7.1	7.4	11.3	317%
Ninebark	8.7	30.0	17.8	8.2	16.9	21.9	152%
Rose	1.7	4.5	4.3	2.7	1.2	2.2	33%
Thimbleberry	0.0	0.0	0.0	0.0	0.8	0.0	0%
Mtn. Willow	0.0	0.0	0.0	0.0	0.1	0.0	0%
Elderberry	0.0	0.0	0.0	0.1	0.0	0.0	0%
White Spirea	2.5	7.4	4.5	4.4	4.5	9.6	286%
Common Snowberry	6.8	30.7	26.6	21.0	24.9	37.9	457%
Total Cover	23.7	87.1	64.5	46.7	68.5	92.4	290%
Herbs							
Unspecified	13.3	19.2	27.5	18.3	4.2	9.2	-31%
Pearly Everlasting	0.0	0.8	0.0	0.0	0.0	0.0	0%
Sandwort	1.7	0.0	0.0	0.0	0.0	0.0	-100%
Conspicous Aster	3.3	5.8	5.0	4.2	11.7	14.2	330%
Pine Grass	0.0	0.0	0.0	0.0	0.8	0.8	80%
Sedge	0.0	0.0	1.7	6.7	5.8	0.0	0%
Common Fireweed	0.0	0.0	0.0	0.0	0.0	0.8	80%
Western Fescue	0.0	0.0	0.0	0.0	0.8	0.0	0%
Sweet Sented Bedstraw	0.0	0.0	0.0	0.0	0.0	0.8	80%
Bicknell Geranium	5.0	0.0	0.0	0.0	0.0	0.0	-100%
Dragonhead	1.7	0.0	0.0	0.0	0.0	0.0	-100%
Clover	4.2	0.0	0.0	0.0	1.7	1.7	-60%
Total Cover	29.2	25.8	34.1	29.2	25.0	27.5	-6%
Non-Vascular							
Rock	3.3	2.5	3.3	2.5	1.7	4.2	26%
Bare Ground	15.8	22.5	6.7	19.2	17.5	11.7	-26%
Litter	37.5	6.7	10.0	32.5	40.0	31.7	-15%
Moss and Lichens	0.0	0.0	13.3	0.0	0.0	1.7	170%
Total Cover	56.7	31.6	33.3	54.1	59.2	49.3	-13%

Table E-7:
White Cap Vegetation Succesion Data - Area 1, Volume Estimates

	1973 Volume	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1978 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs					
Mtn. Maple							0.0	0.1	10%
Serviceberry								0.3	30%
Redstem Ceanothus						0.2	0.7	3.1	310%
Oceanspray								0.3	30%
Mock Orange	27.7	0.0	0.7		1.3	2.5	1.0	0.8	-97%
Ninebark	92.1	4.1	21.1	20.0	24.8	23.1	16.4	28.1	-70%
Rose Hip	0.3	0.3	1.0	0.9	3.1	2.3	1.9	2.0	173%
White Spirea	0.0	2.0	1.3	1.7	1.9	1.2	2.4	3.2	320%
Snowberry	0.6	3.9	7.0	14.2	14.9	17.0	18.0	17.0	1636%
Total Volume	120.8	10.3	31.2	36.7	46.0	46.3	40.4	54.9	-55%
				Herbs					
Unspecified	0.0	3.8	3.4	1.4	2.3	2.8	1.1	3.6	360%
Sandwort	0.0		.0						0%
Broadleaf Arnica	0.0		0.2						0%
Pine Grass	0.0			0.5	0.3	0.5	0.7	1.6	160%
Fairy Bells	0.0						0.2	0.5	50%
Strawberry	0.0							0.2	20%
Globemarrow	0.0							0.2	20%
Miners Lettace	0.0	1.4							0%
Total Volume	0.0	5.2	3.6	1.9	2.7	3.3	2.0	6.1	610%

Table E-8:
White Cap Vegetation Succesion Data - Area 2, Volume Estimates

	1973 Volume	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1978 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs					
Serviceberry	0.5								-46%
Redstem Ceanothus								0.2	20%
Oceanspray					0.1	0.2		0.7	70%
Ninebark	50.1	0.7	1.0	2.6	4.0	4.3	1.8	3.9	-92%
White Spirea		0.1	0.9	0.2	0.7	1.1	1.6	0.8	80%
Snowberry	1.5	1.3	2.0	1.8	4.2	4.7	7.5	11.3	653%
Total Volume	52.0	2.0	3.8	4.6	9.0	10.3	10.9	16.9	-68%
				Herbs					
Unspecified	0.0	2.0	2.2	2.9	3.1	3.9	1.7	2.8	280%
Pathfinder	0.0							0.3	30%
Heartleaf Arnica	0.0							0.1	10%
Conspicous Aster	0.0							0.2	20%
Pine Grass	0.0	0.1	0.3	0.5	0.5	0.3	0.5	0.2	20%
Sweet Bedstraw	0.0				.0				0%
Hawkweed	0.0							0.3	30%
Miners Lettace	0.0	0.5							0%
Total Volume	0.0	2.6	2.5	3.4	3.7	4.2	2.2	3.9	390%

Table E-9:
White Cap Vegetation Succesion Data - Area 3, Volume Estimates

	1973 Volume	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1978 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs					
Mock Orange	27.1		0.7	9.4	2.4			0.0	-100%
Whit Spirea	0.0	0.1	0.2	0.2	0.1	0.2	0.2	0.1	10%
Total Volume	27.1	0.1	0.9	9.5	2.5	0.2	0.2	0.1	-100%
				Herbs					
Unspecified	0.0	1.4	1.0	0.5	1.6	0.1	0.1	0.9	90%
Blue Bunch Wheatgrass	0.0		0.3	0.6	0.8	0.3	1.3	0.8	80%
Arrowleaf Balsmroot	0.0	3.3	6.2	6.7	5.9	7.9	4.3	6.3	630%
Pine Grass						0.2			0%
Indian Paintbrush	0.0			0.3					0%
Idaho Fescue	0.0					0.1			0%
Total Volume	0.0	4.7	7.6	8.1	8.4	8.6	5.7	8.0	800%

Table E-10:
White Cap Vegetation Succesion Data - Area 4, Volume Estimates

	1973 Volume	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1978 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs					
Mtn. Maple	33.5	30.9	25.4	25.4	0.4	0.0	0.0	58.1	74%
Serviceberry	6.4	0.0	0.0	1.1	2.1	0.8	1.9	4.4	-31%
Honeysuckle	0.0	0.0	0.6	1.5	0.0	0.0	1.0	1.8	180%
Menzesia	7.3	0.0	0.0	0.0	0.0	0.0	0.2	0.3	-96%
Thimbleberry	0.4	0.1	0.9	5.3	6.4	12.8	14.8	11.8	1139%
Mtn. Willow	15.6	0.0	0.0	.0	.0	0.2	0.1	0.2	-99%
White Spirea	0.4	0.0	0.0	0.9	4.5	2.8	3.7	2.8	241%
Common Snowberry	0.0	0.0	0.0	.0	0.8	1.1	0.0	0.0	0%
Huckleberry	0.4	0.1	0.8	0.5	0.1	0.0	0.6	0.0	-43%
Total Volume	64.0	31.1	27.7	34.8	14.2	17.7	22.3	79.4	24%
				Herbs					
Unspecified	0.0	1.7	0.9	1.4	1.1	0.1	0.4	0.7	70%
Broadleaf Arnica	0.2	0.7	2.6	4.5	4.5	5.3	5.9	3.9	366%
Goldthread	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.8	80%
Fairy Bells	0.3	1.1	1.0	4.0	4.7	4.1	1.7	2.4	207%
Common Fireweed	0.0	0.0	0.0	0.6	0.0	0.8	0.0	0.0	0%
Bear Grass	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.0	-8%
Total Volume	0.7	3.7	4.6	10.8	10.4	10.6	8.2	7.8	707%

Table E-10:
White Cap Vegetation Succesion Data - Area 5, Volume Estimates

	1973 Volume	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1978 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs					
Mtn. Maple	0.0	.0	0.2	0.9	0.0	5.1	3.8	7.2	720%
Mtn. Alder	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0%
Serviceberry	0.0	.0	0.5	1.9	1.1	0.3	0.0	0.0	0%
Redstem Ceanothus	0.0	0.0	0.0	0.5	0.9	3.1	14.3	45.8	4580%
Ninebark	0.0	14.2	36.1	57.9	51.1	40.7	26.7	32.0	3200%
Rose Hip	0.0	0.0	0.0	0.0	.0	0.2	0.4	0.5	50%
Mtn. Willow	0.0	0.0	0.0	0.5	0.7	1.7	2.9	2.3	230%
White Spirea	0.0	0.0	0.6	1.5	3.9	3.9	2.7	2.7	270%
Common Snowberry	0.0	1.8	2.3	3.3	3.9	7.4	7.9	7.8	780%
Total Volume	0.0	16.1	39.7	67.3	61.7	62.4	58.7	98.3	9830%
				Herbs					
Unspecified	0.0	2.4	2.5	1.0	1.2	1.1	0.4	1.5	150%
Sandwort	0.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
Conspicous Aster	0.0	0.0	0.0	0.0	0.2	0.6	0.7	0.8	80%
Pine Grass	0.0	0.5	0.5	0.6	0.6	0.7	0.6	1.3	130%
Elk Sedge	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0	0%
Thistle	0.0	0.0	0.0	0.5	0.0	0.2	0.0	0.0	
Bicknell Geranium	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	
Self-heal	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0%
Total Volume	0.0	3.6	3.3	2.2	2.2	2.9	1.8	3.6	360%

Table E-12:
White Cap Vegetation Succesion Data - Area 6, Volume Estimates

	1974 Volume	1975 Volume	1976 Volume	1977 Volume	1979 Volume	1980 Volume	Percent Change
				Shrubs			
Mtn. Maple	0.0	0.0	0.0	0.0	8.3	9.0	900%
Serviceberry	0.6	1.7	0.3	1.5	0.5	2.8	221%
Redstem Ceanothus	0.0	0.4	0.4	0.5	1.3	3.5	350%
Ocean Spray	0.0	0.0	0.0	0.1	0.0	0.0	0%
Mock Orange	1.5	12.1	11.3	11.4	13.9	21.8	1334%
Ninebark	4.8	25.3	15.3	9.1	18.5	23.5	390%
[illegible]e Hip	0.5	1.8	2.6	2.3	0.8	1.5	101%
Thimbleberry	0.0	0.0	0.0	0.0	0.2	0.0	0%
Mtn. Willow	0.0	0.0	0.0	0.0	0.0	0.0	0%
Elderberry	0.0	0.0	0.0	.0	0.0	0.0	0%
White Spirea	0.6	3.6	2.5	2.6	2.2	4.0	342%
Common Snowberry	2.7	16.7	14.6	15.7	14.4	22.2	710%
Total Volume	10.7	61.5	47.0	43.3	60.1	88.3	724%
				Herbs			
Unspecified	1.5	3.8	5.3	5.7	0.9	1.7	10%
Pearly Everlasting	0.0	0.5	0.0	0.0	0.0	0.0	0%
Sandwort	0.1	0.0	0.0	0.0	0.0	0.0	-8%
Conspicous Aster	1.2	2.2	2.2	2.1	4.2	4.7	305%
Pine Grass	0.0	0.0	0.0	0.0	0.1	0.1	10%
Sedge	0.0	0.0	0.1	1.7	0.8	0.0	0%
Common Fireweed	0.0	0.0	0.0	0.0	0.0	0.4	40%
Western Fescue	0.0	0.0	0.0	0.0	0.1	0.0	0%
Sweet Sented Bedstraw	0.0	0.0	0.0	0.0	0.0	0.1	10%
Bicknell Geranium	0.5	0.0	0.0	0.0	0.0	0.0	-54%
Dragonhead	0.4	0.0	0.0	0.0	0.0	0.0	-41%
Clover	0.2	0.0	0.0	0.0	0.2	0.2	-4%
Total Volume	4.0	6.6	7.6	9.5	6.3	7.2	81%